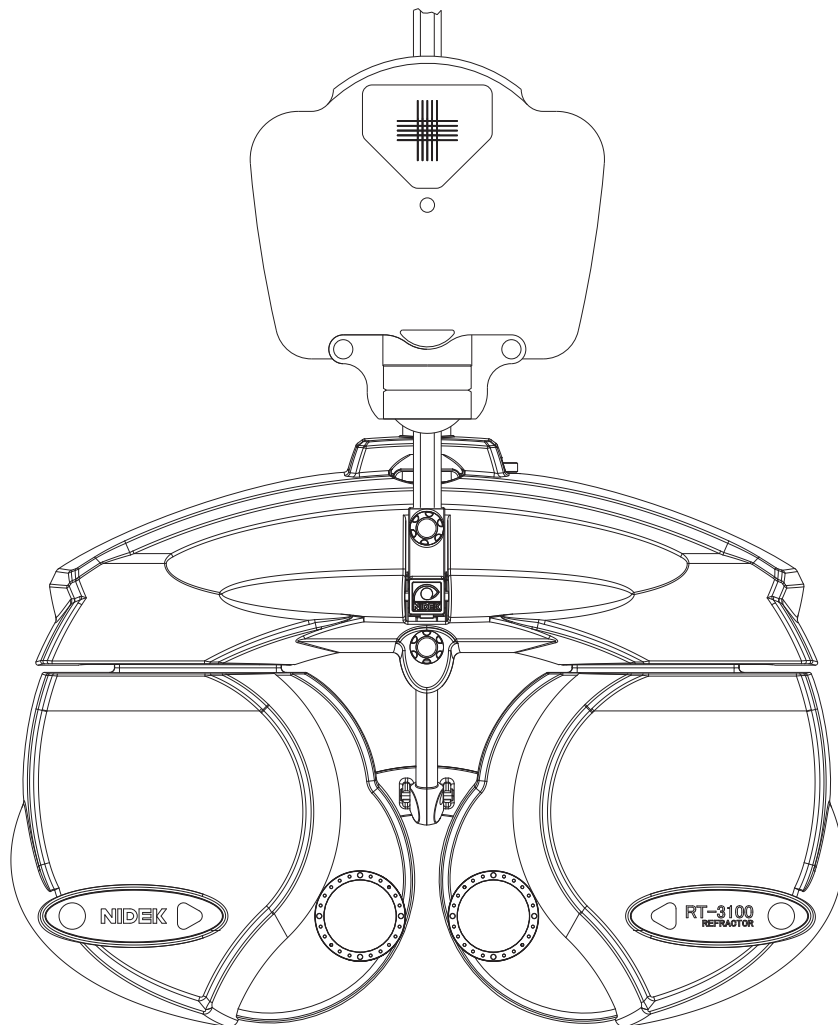


NIDEK

REFRACTOR

Model **RT-3100**

SERVICE MANUAL





NIDEK CO., LTD.

NIDEK CO., LTD.
(Manufacturer)

NIDEK CO., LTD
(Tokyo Office)

NIDEK INCORPORATED
(United States Agent)

NIDEK SOCIETE ANONYME
(EU Authorized Representative)

: 34-14, Maehama, Hiroishi-cho, Gamagori, Aichi 443-0038, Japan
Telephone: 81-533- 67-6611
Facsimile: 81-533-67-6610
: 3F Sumitomo Fudosan Hongo Bldg., 3-22-5, Hongo,
Bunkyo-Ku, Tokyo 113-0033, Japan
Telephone: 81-3-5844-2641
Facsimile: 81-3-5844-2642
: 47651 Westinghouse Drive, Fremont, California 94539, U. S. A.
Telephone: 1-510-226-5700
Facsimile: 1-510-226-5750
: Europarc 13, rue Auguste Perret, 94042 CRETEIL, France
Telephone: 33-1-49 80 97 97
Facsimile: 33-1-49 80 32 08

Table of Contents

1. INTRODUCTION	1
2. SAFETY PRECAUTIONS	3
3. SPECIFICATIONS	5
3 . 1 Product components	5
3 . 2 Measurable Range	5
3 . 3 Refractor head	5
3 . 4 Control Box	6
3 . 5 Relay Box	6
4. TROUBLESHOOTING	7
5. SUBTROUBLESHOOTING	9
5 . 1 Startup Screen does not Appear on Control Box	9
5 . 1 . 1 Backlight of color LCD module does not light up	10
5 . 2 Error Message Appears	11
5 . 2 . 1 Error 01: Communication Error CB-MB.	11
5 . 2 . 2 Chart doesn't work.	12
5 . 2 . 3 No print paper.	13
5 . 2 . 4 Printer cover is open.	13
5 . 2 . 5 Printer Error.	14
5 . 2 . 6 Setup data is initialized.	14
5 . 2 . 7 CF card -- Read Error!!	15
5 . 2 . 8 CF card -- Write Error!!	15
5 . 2 . 9 CF card -- Card not found!!	15
5 . 2 . 10 Error : XX Y	16
5 . 2 . 11 Error : R DRIVER BOARD	17
5 . 2 . 12 Error : L DRIVER BOARD	17
5 . 2 . 13 Error : R DRIVER VERSION	17
5 . 2 . 14 Error : L DRIVER VERSION.	17
5 . 3 Initialization does not Complete Normally	18
5 . 3 . 1 Right and left disk units of the refractor head does not move right and left	19
5 . 3 . 2 R disk ASSY (34090-1100) does not rotate	21
5 . 3 . 2 . 1 S2 disk (34085-1130) does not rotate	23
5 . 3 . 2 . 2 S1 disk (34085-1140) does not rotate	23
5 . 3 . 2 . 3 C disk R (34085-1150) does not rotate	23
5 . 3 . 2 . 4 A1 disk R (34085-1160) does not rotate	23
5 . 3 . 2 . 5 A2 disk R (34085-1170) does not rotate	24

5 . 3 . 3	L disk ASSY (34090-1200) does not rotate	25
5 . 3 . 3 . 1	S2 disk (34085-1130) does not rotate	26
5 . 3 . 3 . 2	S1 disk (34085-1140) does not rotate	26
5 . 3 . 3 . 3	C disk L (34085-1250) does not rotate	26
5 . 3 . 3 . 4	A1 disk L (34085-1260) does not rotate	26
5 . 3 . 3 . 5	A2 disk L (34085-1270) does not rotate	27
5 . 3 . 4	PD and convergence of refractor head are not initialized normally . .	28
5 . 3 . 5	Right disk of the refractor head is not initialized normally	29
5 . 3 . 6	Left disk of refractor head is not initialized normally	30
5 . 4	Control Box is not Operational	31
5 . 4 . 1	Switches are not operational	31
5 . 4 . 2	Dial is not operational	32
5 . 4 . 3	Touch-screen panel is not operational	33
5 . 5	Compact Flash card is not operational	34
5 . 6	IC card is operational	34
5 . 7	Printer does not Print	35
5 . 8	Chart does not Function as Operated on Control Box	36

6. REMOVAL PROCEDURES37

6 . 1	Refractor Head	37
6 . 1 . 1	Upper cover J (34090-M259)	37
6 . 1 . 2	Upper-rear cover (34090-2900)	37
6 . 1 . 3	Upper cover F (34090-M257)	38
6 . 1 . 4	Face shield R (34090-1850), Face shield L (34090-1950)	38
6 . 1 . 5	Rear cover R (34090-1800)	39
6 . 1 . 6	Front cover R (34090-1600)	39
6 . 1 . 7	Rear cover L (34090-1900)	40
6 . 1 . 8	Front cover L (34090-1700)	40
6 . 2	Control Box	41
6 . 2 . 1	Lower cover (34090-M402)	41
6 . 2 . 2	cover R (34090-M429)	42
6 . 2 . 3	Cover L (34090-M430)	42

7. REPLACEMENT PROCEDURES43

7 . 1	ASSYs	43
7 . 1 . 1	LCD ASSY (34090-4200)	43
7 . 1 . 2	Printer ASSY (34090-4400)	43
7 . 1 . 3	Motor SCA (34085-1310)	44
7 . 1 . 3 . 1	Motor SCA in Frame R (34090-1300)	44
7 . 1 . 3 . 1 . 1	Motor SCA for S2 disk	44
7 . 1 . 3 . 1 . 2	Motor SCA for S1 disk	44
7 . 1 . 3 . 1 . 3	Motor SCA for C2 disk	45
7 . 1 . 3 . 2	Motor SCA in frame L (34090-1400)	45
7 . 1 . 3 . 2 . 1	Motor SCA for S2 disk	45
7 . 1 . 3 . 2 . 2	Motor SCA for S1 disk	46
7 . 1 . 3 . 2 . 3	Motor SCA for C2 disk	46

7 . 1 . 4	Motor PCA (34058-1320)	47
7 . 1 . 4 . 1	Motor PCA in frame R (34090-1300)	47
7 . 1 . 4 . 1 . 1	Motor PCA for CA disk	47
7 . 1 . 4 . 1 . 2	Motor PCA for P2 disk	47
7 . 1 . 4 . 2	Motor PCA for frame L (34090-1400)	48
7 . 1 . 4 . 2 . 1	Motor PCA for CA disk	48
7 . 1 . 4 . 2 . 2	Motor PCA for P2 disk	48
7 . 1 . 5	PD motor R (34085-2510)	49
7 . 1 . 6	COM motor R (34085-2520)	49
7 . 1 . 7	PD motor L (34085-2610)	50
7 . 1 . 8	COM motor L (34085-2620)	50
7 . 2	Boards	51
7 . 2 . 1	MB main board (34085-BA01)	51
7 . 2 . 2	MB L board (34090-BA02)	51
7 . 2 . 3	MB R board (34090-BA04)	52
7 . 2 . 4	CB main board (34090-BA11)	53
7 . 2 . 5	Key I/F board (34090-BA12)	54
7 . 2 . 6	LCD I/F board (34090-BA13)	55
7 . 2 . 7	RB main board (34090-BA21)	55
7 . 2 . 8	PI sensor board (34085-BA09)	56
7 . 2 . 8 . 1	PI sensor board on upper base R ASSY (34085-2500)	56
7 . 2 . 8 . 1 . 1	PI sensor board for CON	56
7 . 2 . 8 . 1 . 2	PI sensor board for PD	56
7 . 2 . 8 . 2	PI sensor board on upper base L (34085-2600)	57
7 . 2 . 8 . 2 . 1	PI sensor board for CON	57
7 . 2 . 8 . 2 . 2	PI sensor board for PD	57
7 . 2 . 9	Printer interface board (80606-00021)	58
7 . 2 . 10	Switching power supply (80602-00114)	58
7 . 3	Electrical Parts	59
7 . 3 . 1	Printer (80606-00020)	59
7 . 3 . 2	5.7-inch LCD with touch panel (34090-E011)	59
7 . 3 . 3	Rotary encoder (34085-E202)	60

8. ADJUSTMENT 61

8 . 1	Displaying Information/Adjustment Screen	61
8 . 2	MB Initial Pulse Setting	61
8 . 3	Lens Cleaning Mode	62
8 . 4	Gear adjustment mode	62
8 . 5	Chart Selection	63
8 . 6	Chart Adjustment	63
8 . 7	Mirror Adjustment	64
8 . 8	Language	64
8 . 9	Clock Setting	65
8 . 10	Touch-Screen Panel Calibration	65
8 . 11	Parameter Settings	66
8 . 12	Printing Adjustment Value	66

8 . 13	Resetting Setup Data	66
8 . 14	Checking Keys	67
8 . 15	Upgrading Software	68

9. SUPPLEMENT.....69

9 . 1	Wiring Diagram	69
9 . 2	Connector cables	70
9 . 3	Error Messages	73
9 . 4	Parameter List	74
9 . 5	External View	75
9 . 5 . 1	Refractor head	75
9 . 5 . 2	Control box	76
9 . 5 . 3	Relay box	76
9 . 6	Labels	77
9 . 6 . 1	Control box	77
9 . 6 . 2	Relay box	78
9 . 7	DIP Switch Function Table	79
9 . 8	Configuration of motors	80
9 . 8 . 1	Patient's side	80
9 . 8 . 2	Operator's side	80
9 . 9	Screw List	81

1 INTRODUCTION

This service manual is for the REFRACTOR, RT-3100.

For correct service, thorough understanding of the contents of this manual is required prior to the service.

Refer to the Operator's Manual and Parts List for the RT-3100

Refer to the Service Manual Annex for important changes.

The descriptions in this manual are subject to change without notice for improvement.





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2 SAFETY PRECAUTIONS

1 . General precautions

- 1) Servicing should be performed by NIDEK service persons or other qualified personnel.
- 2) In case the device cannot be repaired according to the procedures described in this manual, please report the serial number and details of the symptom or symptoms.
- 3) Perform all servicing according to the procedures described in this manual. Failure to do so may cause accident or malfunction.
- 4) When performing maintenance work, turn off the power switch and disconnect the power cord from the wall outlet unless the power needs to be on.
- 5) Never wipe the covers using an organic solvent such as a paint thinner. Doing so may damage the surface, and as a result, impair the appearance of the device.

2 . Maintenance precautions

- 1) In case of system malfunction, check the symptom and turn off the power switch.
- 2) Never drop parts or screws inside the device, nor bump it against surrounding objects.
- 3) Prepare storage cases so as not to lose the removed screws or parts.
- 4) Screw or unscrew screws with proper tools.
- 5) After loosening the screws fastened by a threadlocking adhesive, be sure to reapply the threadlocking adhesive to the screws when retightening them.
- 6) After replacing parts, make sure that they are fastened securely before turning on the power.
- 7) Should you observe strange odors or smoke being issued from the device, immediately turn off the power switch, disconnect the power cord from the outlet, and investigate the cause.
- 8) If the system is powered in abnormal conditions, fire, electric shock or total loss of the device may result.
- 9) See Wiring Diagram and Connector Cables for checking cable breaks as described in "TROUBLESHOOTING". In addition, check cables for the following:
 - a . Connectors are connected and crimped securely.
 - b . No contact failure occurs after re-connection of connectors.
 - c . Cables are soldered properly.
- * Do not yank the cables with excessive force. Doing so could cause cable breakage.
- * Never perform maintenance work with wet hands. Electric shock or failure of the system may result.
- 10) The  labeled area indicates high voltage. Take proper care against electric shock.
- 11) When a cable with any of the following marks is disconnected and reconnected, be sure to check that the screws are tightened sufficiently.
 - a . Protective ground: 
 - b . Functional ground: 
 - c . Equipotential: 

3 . Adjustment precautions

- 1) Make sure that the following conditions are met before installation.
 - a . A place which is level and stable without vibration and shock
 - b . No exposure to direct sunlight or ultraviolet rays
 - c . A place with minimal external light sources
 - d . No exposure to water
 - e . A place where the temperature and humidity meet the specifications for use
- 2) Do not use adjustment jigs for purposes other than those intended.

3 SPECIFICATIONS

3.1 Product components

* The components can be shipped alone, in combination with other units, or installed with a table or stand.

- | | |
|--------------------|--------|
| 1 . Refractor head | 1 unit |
| 2 . Control box | 1 unit |
| 3 . Relay box | 1 unit |

3.2 Measurable Range

- | | |
|------------------------|--|
| 1 . Spherical power | -19.00 to +16.75 D (In increments of 0.25/0.5 to 3.0 D) |
| 2 . Cylindrical power | 0.00 to ± 6.00 D (In increments of 0.25/1 D) |
| 3 . Cylindrical axis | 0° to 180° (in increments of 1°/5°) |
| 4 . Pupillary distance | 48 to 80 mm (Far mode)
50 to 74 mm (Near working distance of 35 cm)
54 to 80 mm (Far PD possible for 100% convergence) |
| 5 . Prism | 0 to 20 Δ (In increments of 0.1 Δ /0.5 Δ /2 Δ) |

3.3 Refractor head

- | | |
|---|--|
| 1 . Auxiliary lens | |
| 1) Cross cylinder lens (± 0.25 D) | |
| 2) Occluder | |
| 3) Pinhole plate ($\varnothing 2$ mm) | |
| 4) Red-green filter (Right eye: red, Left eye: green) | |
| 5) Polarizing filters (Right eye: 135°/45°, Left eye: 45°/135°) | |
| 6) For adjusting the pupillary distance | |
| 7) Fixed cross cylinder lens (1 ± 0.50 D minus axis 90°) | |
| 8) Spherical lenses for retinoscope (+1.5 D/+2.0 D) | |
| 9) Red maddox rod (Red) (Right eye: horizontal, Left eye: vertical) | |
| 10) Dissociation prism (Right eye: 6 Δ BU, Left eye: 10 Δ BI) | |
| 11) Dissociation prism (Right eye: 3 Δ BD, Left eye: 3 Δ BU) | |
| 2 . Refraction distance for near vision | 350 to 700 mm (Selectable in increments of 50 mm) |
| 3 . Visual field | 40° (VD = 12 mm) |
| 4 . Forehead rest adjustment range | 14 \pm 2 mm (available at 20 mm or more in the test) |
| 5 . Vertex distance marking | 12, 13.75, 16, 18, 20 mm |
| 6 . Level adjustment | $\pm 2.5^\circ$ |
| 7 . Dimensions (W \times D \times H) | 370 \times 100 \times 290 mm (excluding the bracket) |
| 8 . Weight | 3.5 kg |

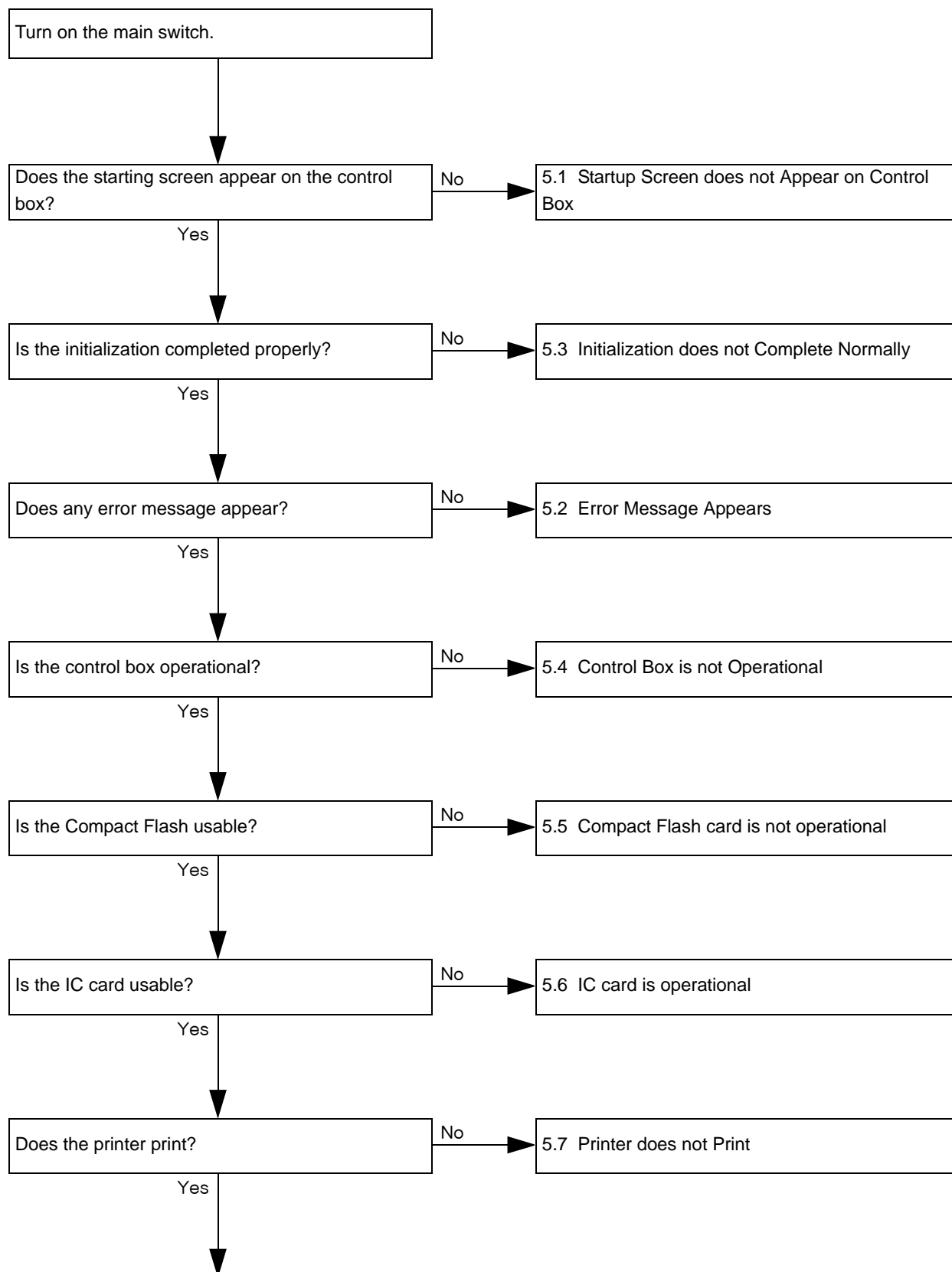
3.4 Control Box

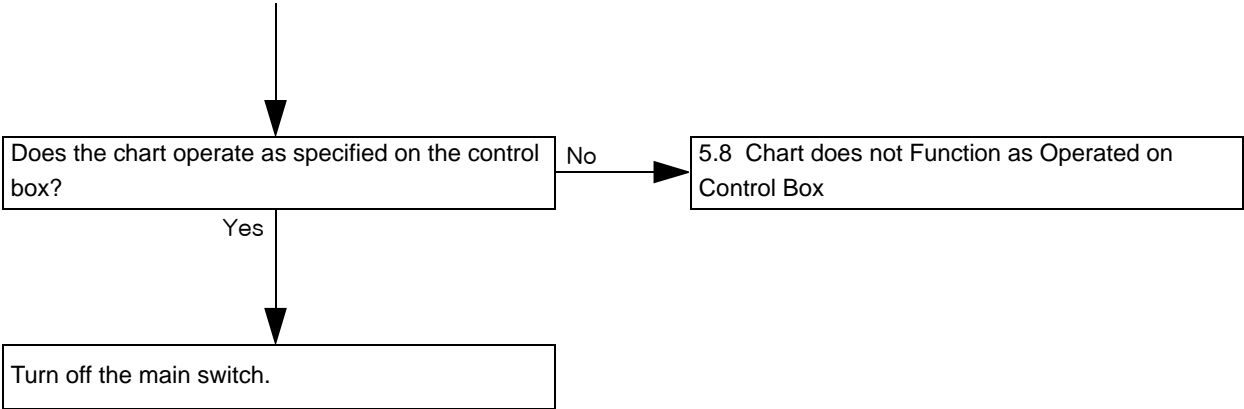
1 . Display	Dot-matrix screen, color LCD (5.7-inch) with touch panel
2 . Printer	
1) Recording mode	Thermal
2) Printed items	Name, sex, working distance, measurement results
3 . Dimensions (W × D × H)	180 × 190 × 220 mm
4 . Weight	1.7 kg

3.5 Relay Box

1 . Interface	Interface function in compliance with the RS-232C
2 . Power specifications	
1) Voltage	AC100 to 240 V (±10%)
2) Frequency	50/60 Hz
3) Power consumption	80 VA
3 . Dimensions (W × D × H)	194 × 227 × 61 mm
4 . Weight	2.0 kg

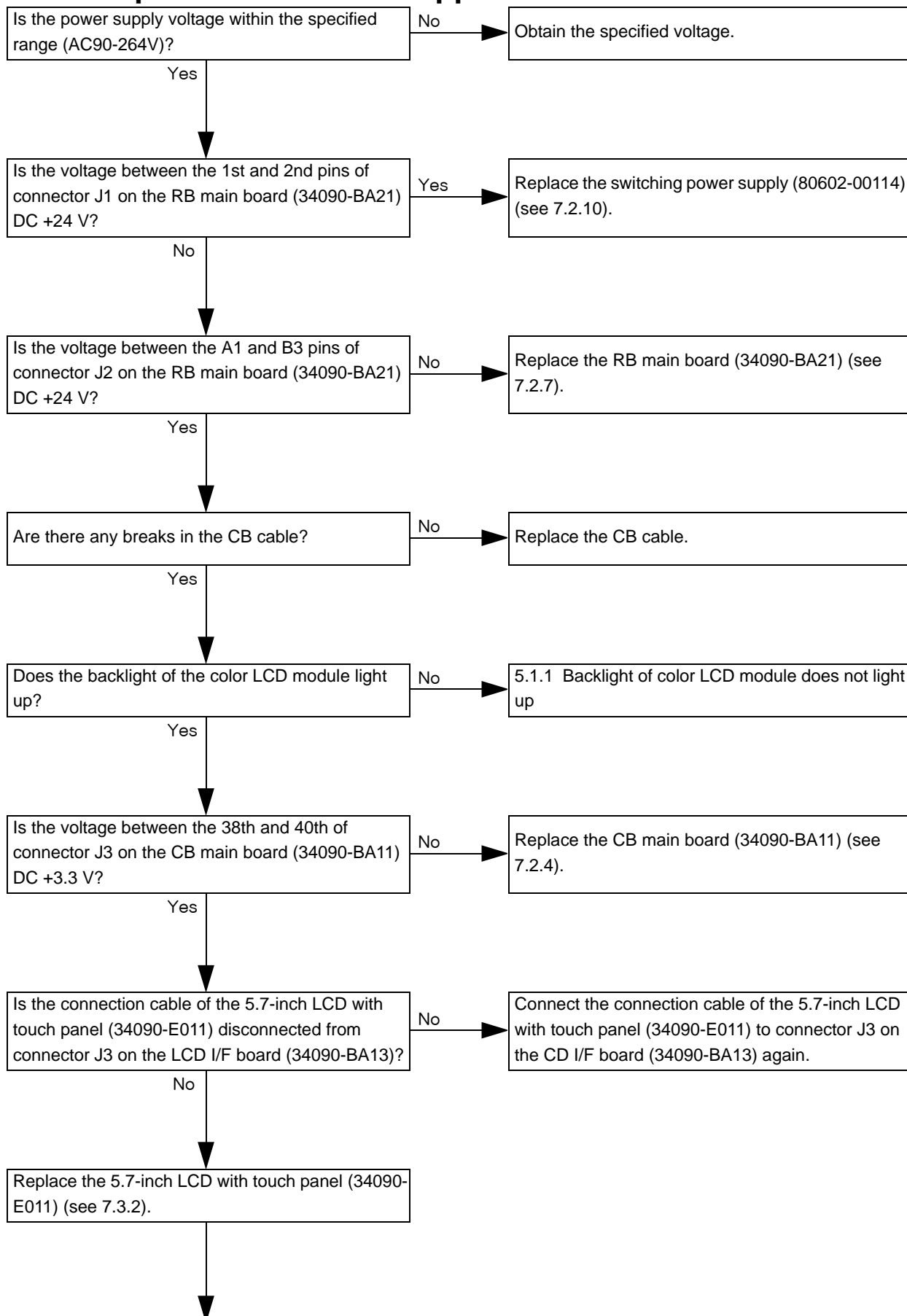
4 TROUBLESHOOTING

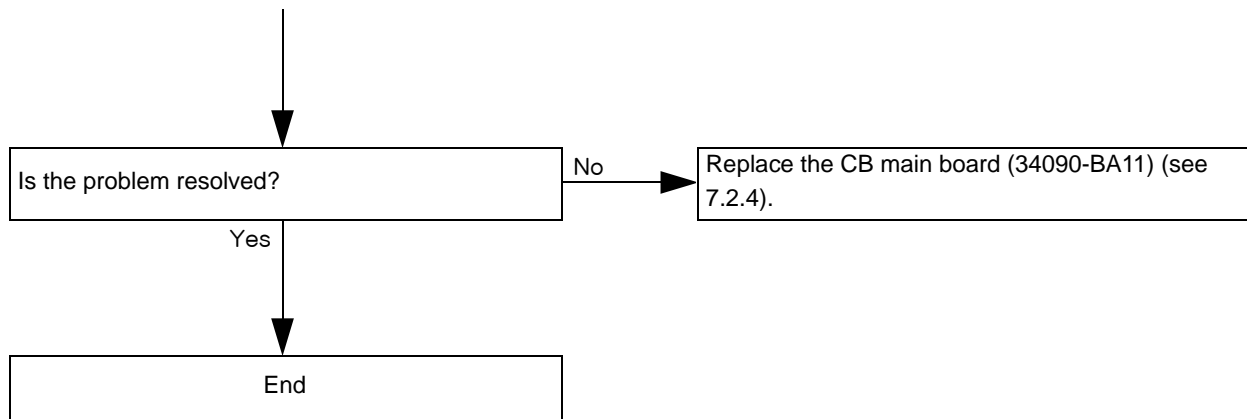




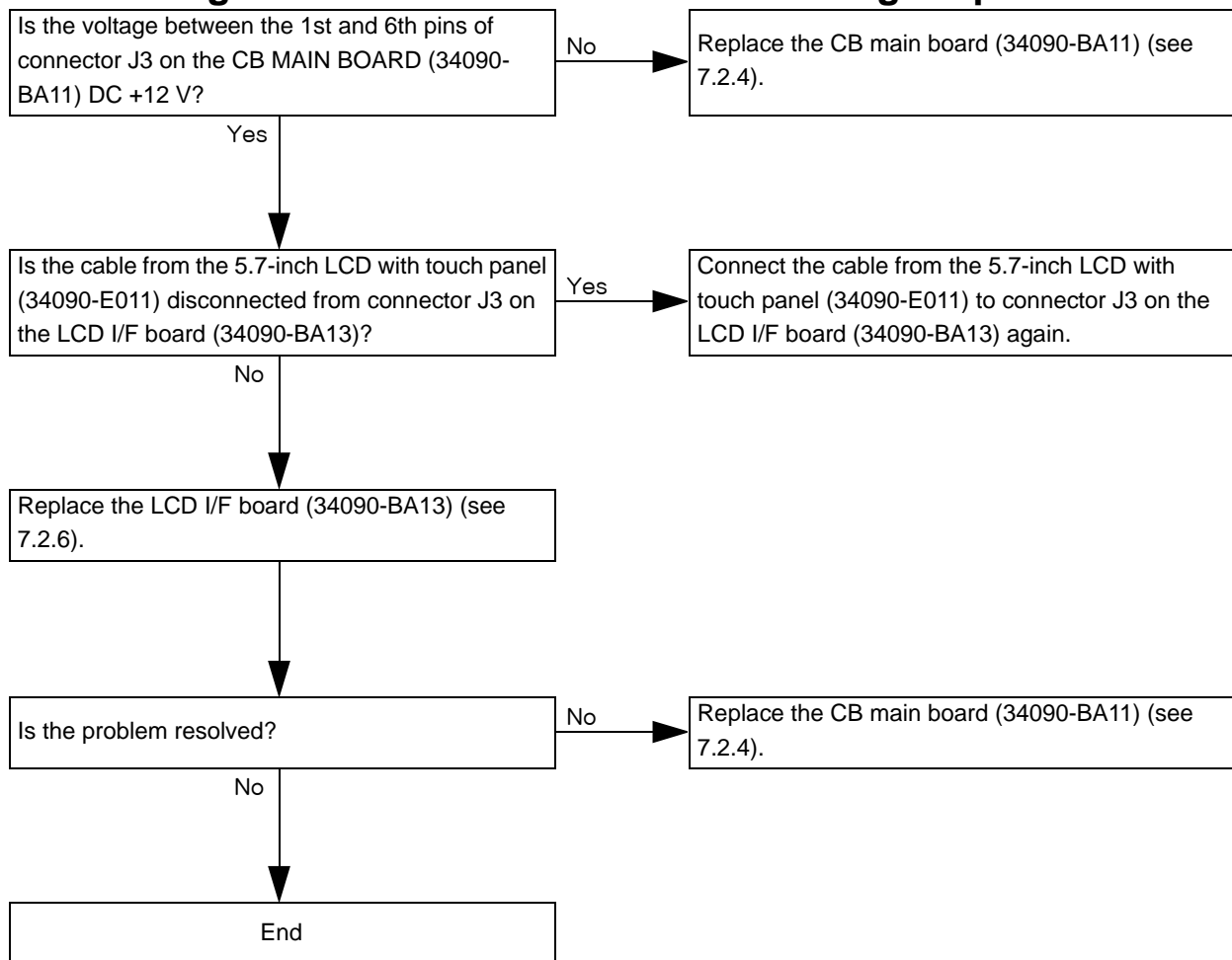
5 SUBTROUBLESHOOTING

5.1 Startup Screen does not Appear on Control Box



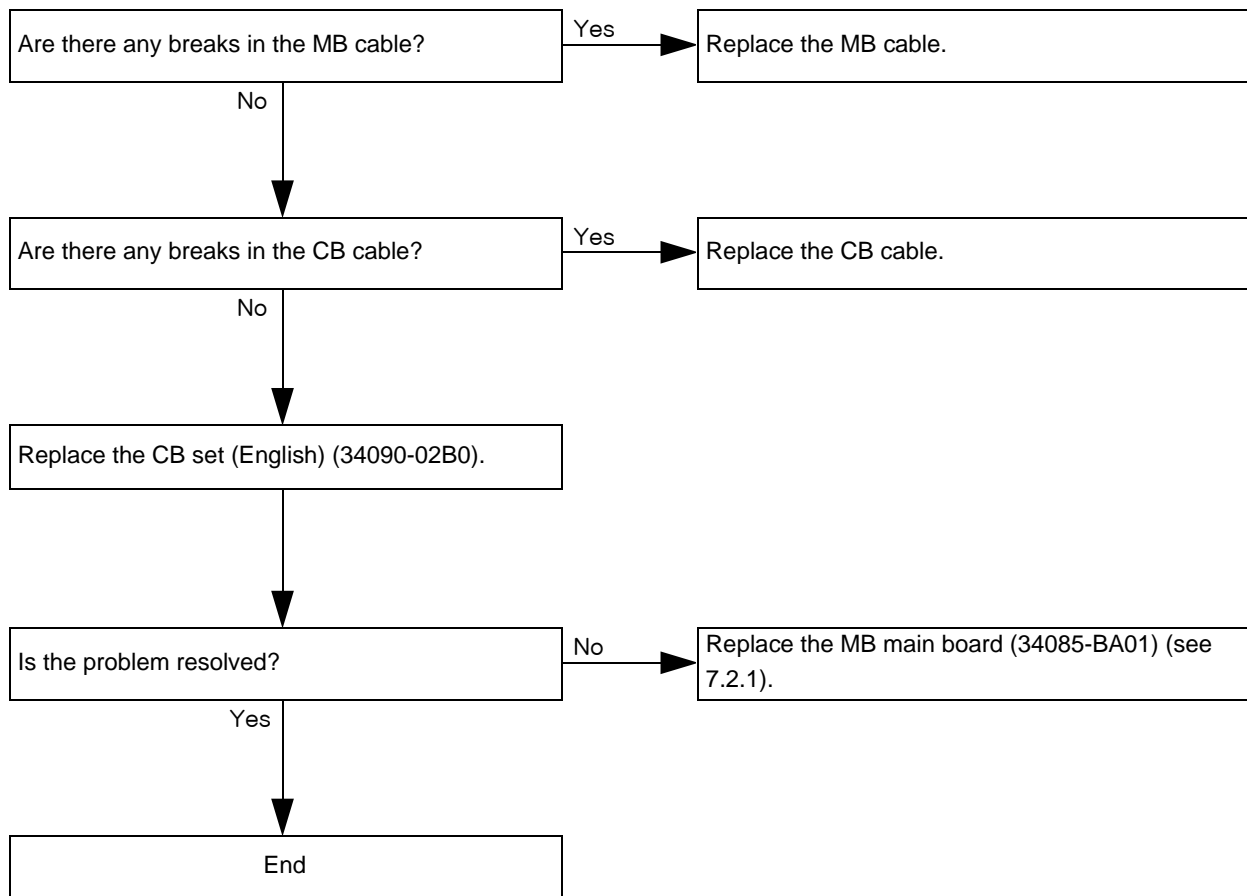


5.1.1 Backlight of color LCD module does not light up

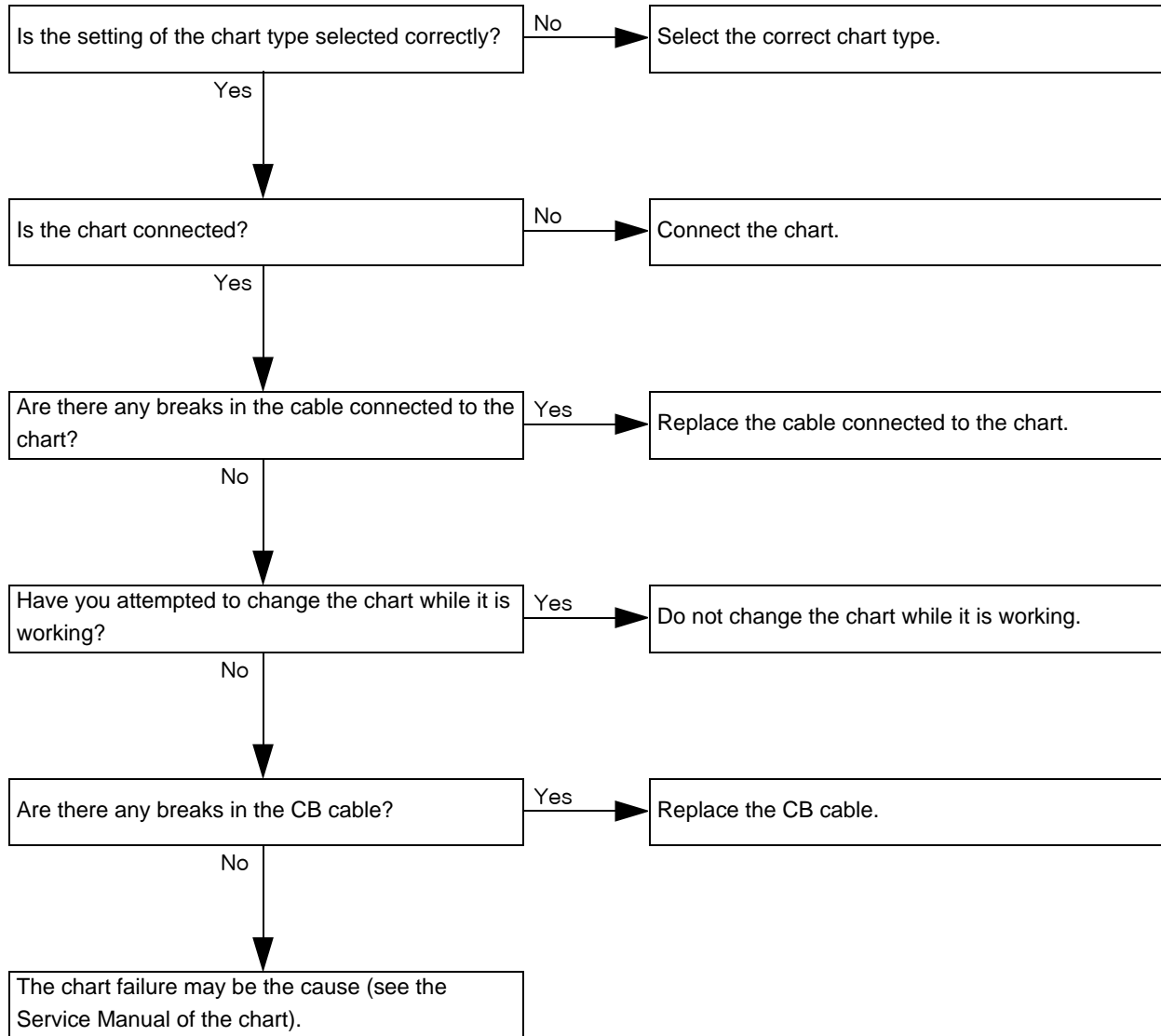


5.2 Error Message Appears

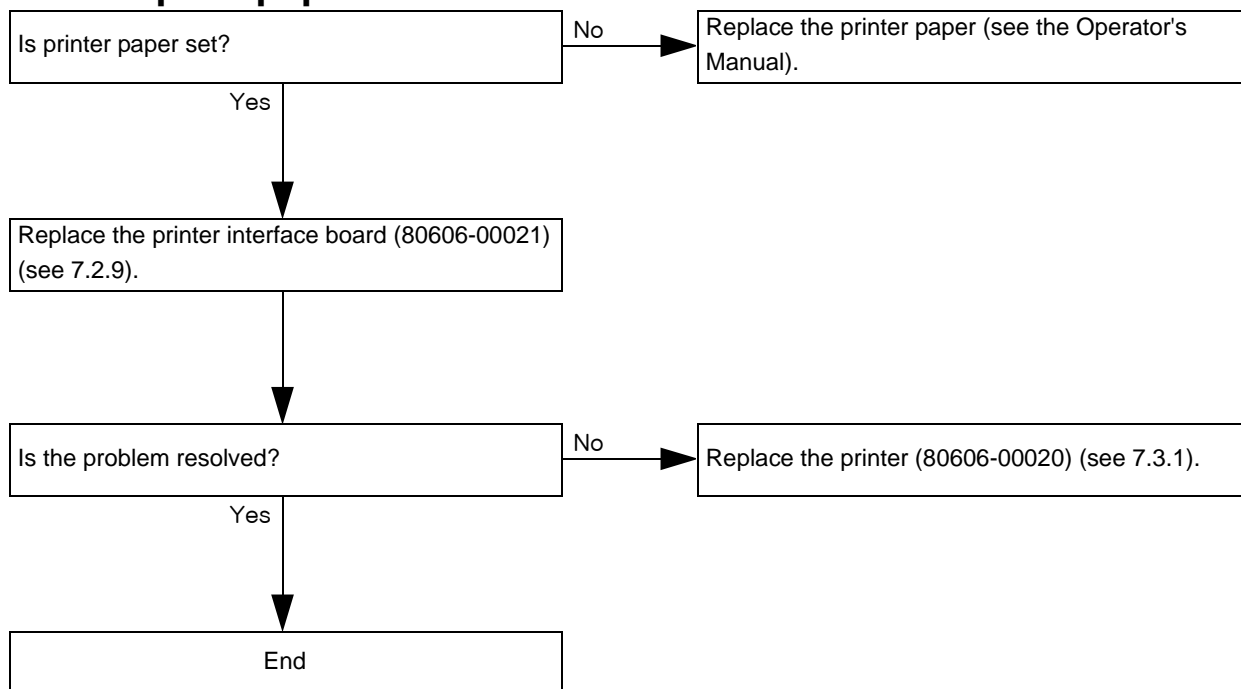
5.2.1 Error 01: Communication Error CB-MB.



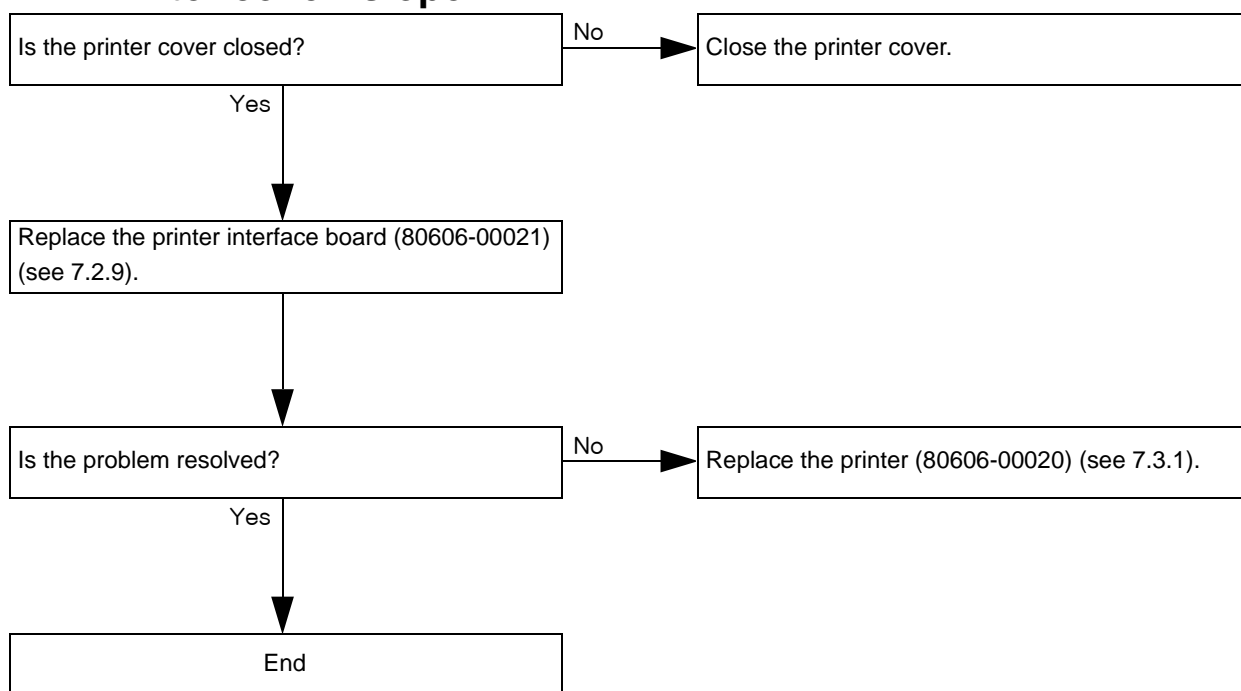
5.2.2 Chart doesn't work.



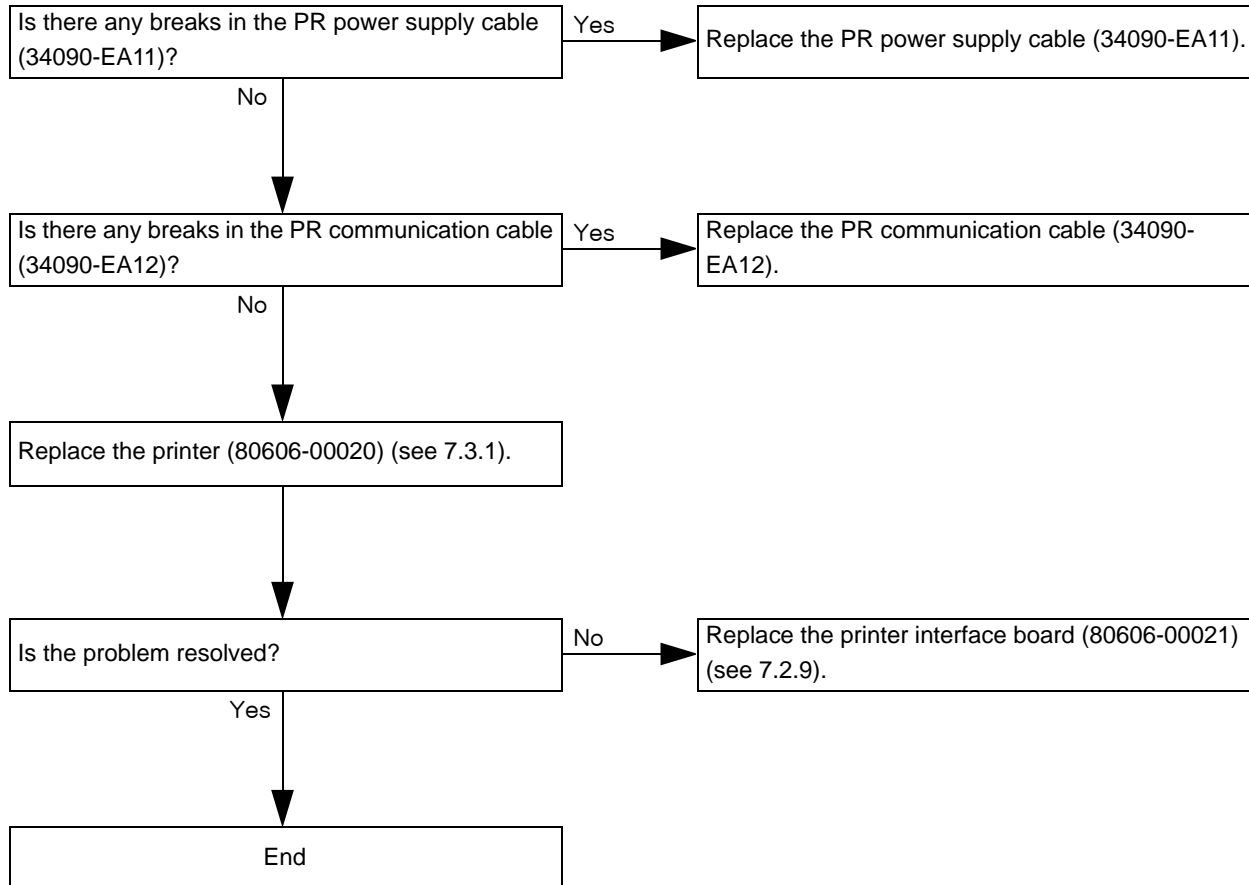
5.2.3 No print paper.



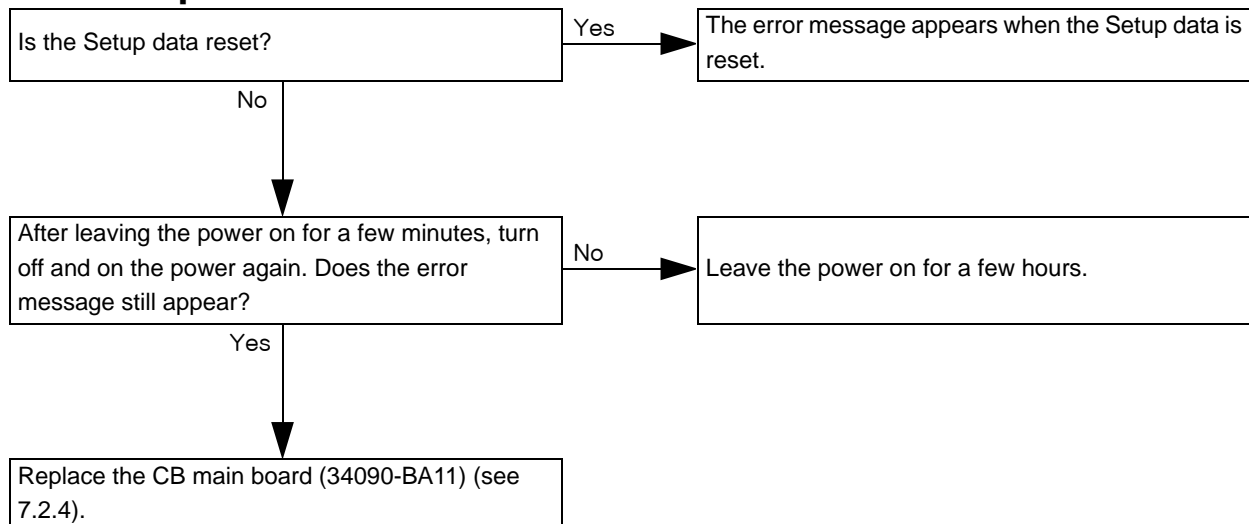
5.2.4 Printer cover is open.



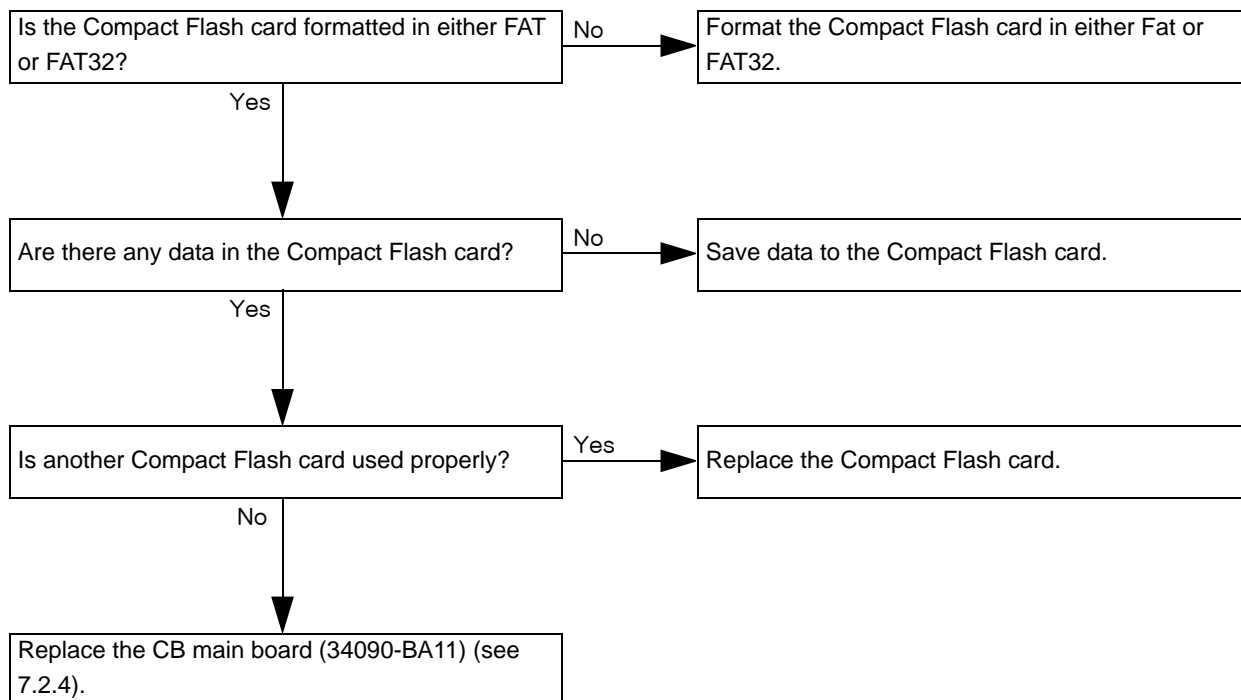
5.2.5 Printer Error.



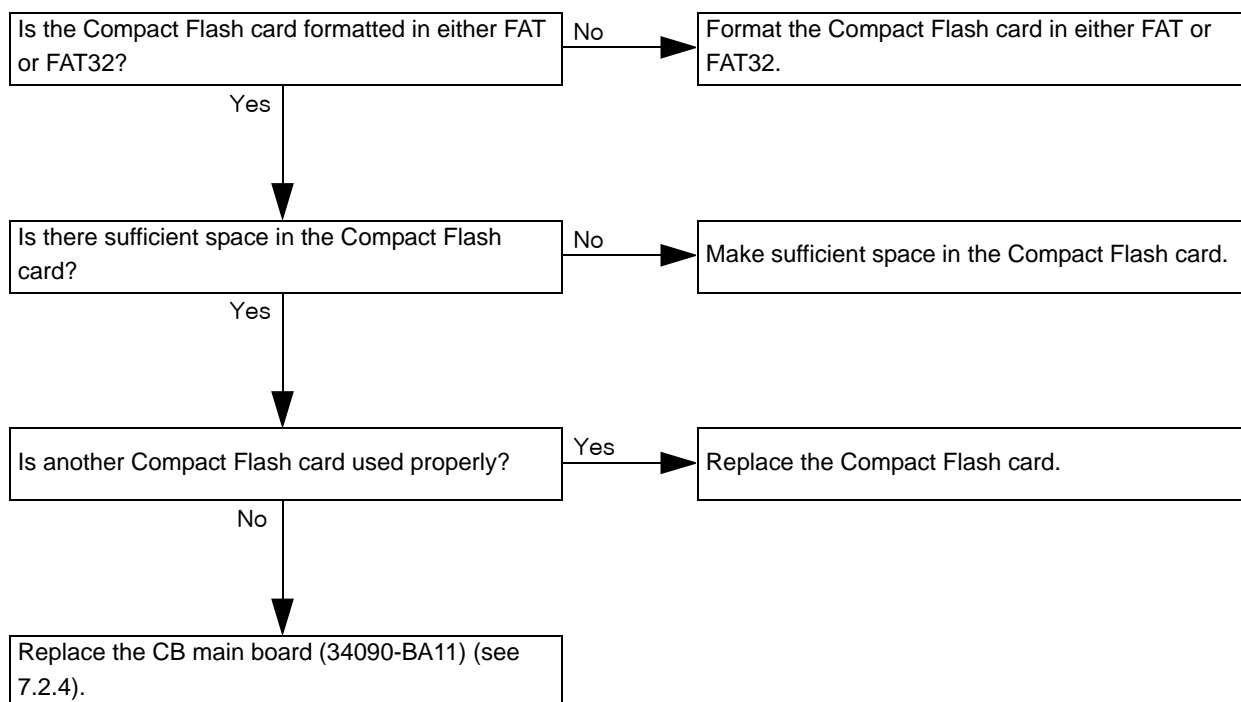
5.2.6 Setup data is initialized.



5.2.7 CF card -- Read Error!!



5.2.8 CF card -- Write Error!!



5.2.9 CF card -- Card not found!!

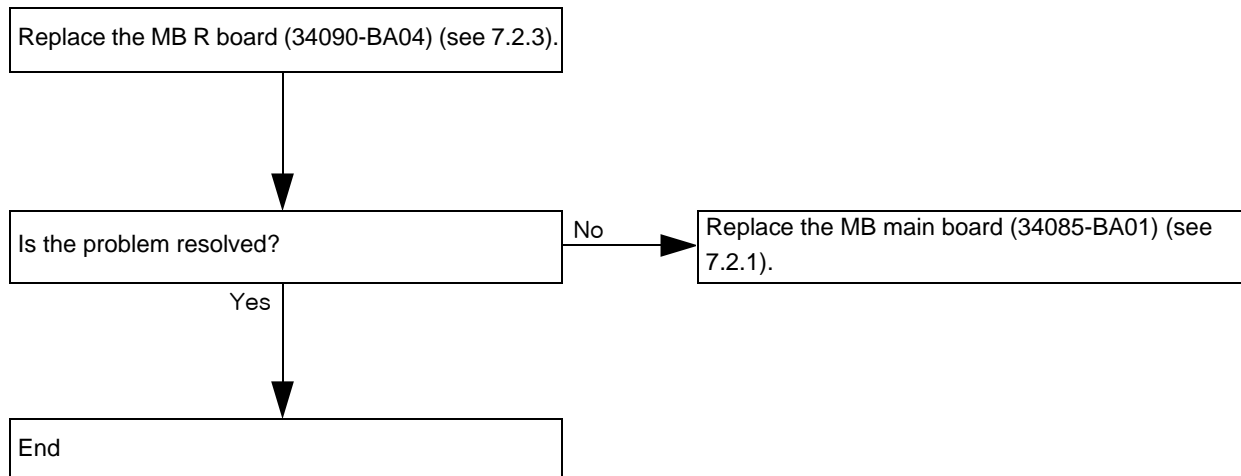
The Compact Flash card is not inserted.
Insert the Compact Flash card.

5.2.10 Error : XX Y

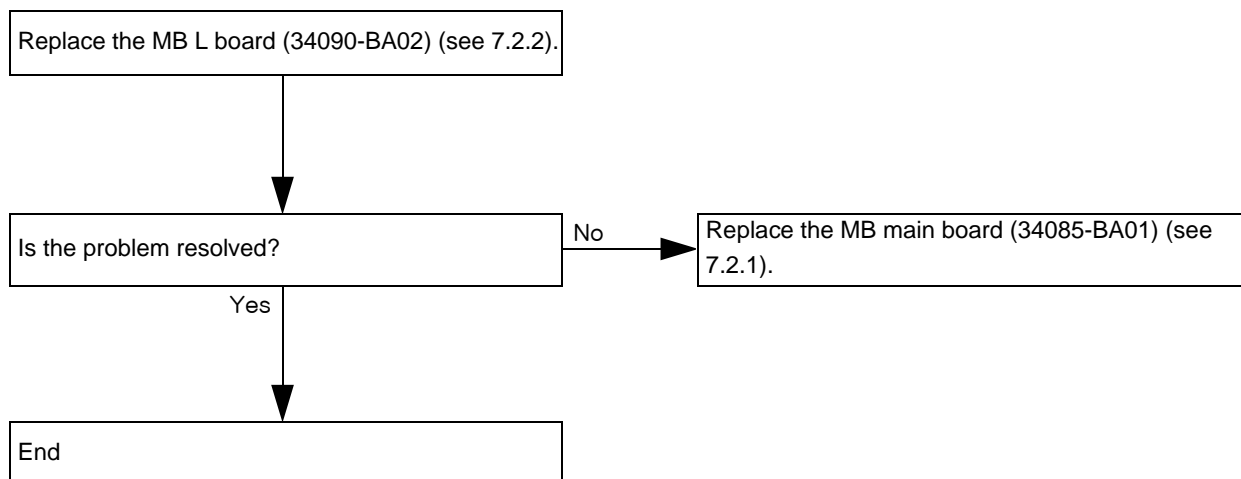
- * "XX" indicates the sensor name (S1/S2/C1/C2/CA/A1/A2/P1/P2/PD/CON)
- * "Y" indicates the right or left (R/L)
- * When error messages appear even though the parts below is replaced, return the parts.

Error messages	Replacement parts	Reference
Error : S1 R	MB R board (34090-BA04)	(see 7.2.3)
	Motor SCA for S1 disk R (34085-1310)	(see 7.1.3.1.2)
Error : S2 R	MB R board (34090-BA04)	(see 7.2.3)
	Motor SCA for S2 disk R (34085-1310)	(see 7.1.3.1.1)
Error : C1 R	MB R board (34090-BA04)	(see 7.2.3)
Error : C2 R	MB R board (34090-BA04)	(see 7.2.3)
	Motor SCA for C2 disk R (34085-1310)	(see 7.1.3.1.3)
Error : CA R	MB R board (34090-BA04)	(see 7.2.3)
	Motor PCA for CA disk R (34085-1320)	(see 7.1.4.1.1)
Error : A1 R	MB R board (34090-BA04)	(see 7.2.3)
Error : A2 R	MB R board (34090-BA04)	(see 7.2.3)
Error : P1 R	MB R board (34090-BA04)	(see 7.2.3)
Error : P2 R	MB R board (34090-BA04)	(see 7.2.3)
	Motor PCA for P2 disk R (34085-1320)	(see 7.1.4.1.2)
Error : PD R	MB main board (34085-BA01)	(see 7.2.1)
	PD motor R (34085-2510)	(see 7.1.5)
	PI sensor board (34085-BA08) for PD on upper base R ASSY (34085-2500)	(see 7.2.8.1.2)
Error : CON R	MB main board (34085-BA01)	(see 7.2.1)
	CON motor R (34085-2520)	(see 7.1.6)
	PI sensor board (34085-BA08) for CON on upper base R ASSY (34085-2500)	(see 7.2.8.1.1)
Error : S1 L	MB L board (34090-BA042)	(see 7.2.2)
	Motor SCA for S1 disk L (34085-1310)	(see 7.1.3.2.2)
Error : S2 L	MB L board (34090-BA042)	(see 7.2.2)
	Motor SCA for S2 disk L (34085-1310)	(see 7.1.3.2.1)
Error : C1 L	MB L board (34090-BA042)	(see 7.2.2)
Error : C2 L	MB L board (34090-BA042)	(see 7.2.2)
	Motor SCA for C2 disk L (34085-1310)	(see 7.1.3.2.3)
Error : CA L	MB L board (34090-BA042)	(see 7.2.2)
	Motor PCA for C2 disk L (34085-1320)	(see 7.1.4.2.1)
Error : A1 L	MB L board (34090-BA042)	(see 7.2.2)
Error : A2 L	MB L board (34090-BA042)	(see 7.2.2)
Error : P1 L	MB L board (34090-BA042)	(see 7.2.2)
Error : P2 L	MB L board (34090-BA042)	(see 7.2.2)
	Motor PCA for P2 disk L (34085-1320)	(see 7.1.4.2.2)
Error : PD L	MB main board (34085-BA01)	(see 7.2.1)
	PD motor L (34085-2610)	(see 7.1.7)
	PI sensor board (34085-BA08) for PD on upper base L ASSY (34085-2600)	(see 7.2.8.2.2)
Error : CON L	MB main board (34085-BA01)	(see 7.2.1)
	CON motor L (34085-2620)	(see 7.1.8)
	PI sensor board (34085-BA08) for PD on upper base L ASSY (34085-2600)	(see 7.2.8.2.1)

5.2.11 Error : R DRIVER BOARD



5.2.12 Error : L DRIVER BOARD



5.2.13 Error : R DRIVER VERSION

The version of the MB R board (34090-BA04) is not compatible to that of the MB main board (34085-BA01).

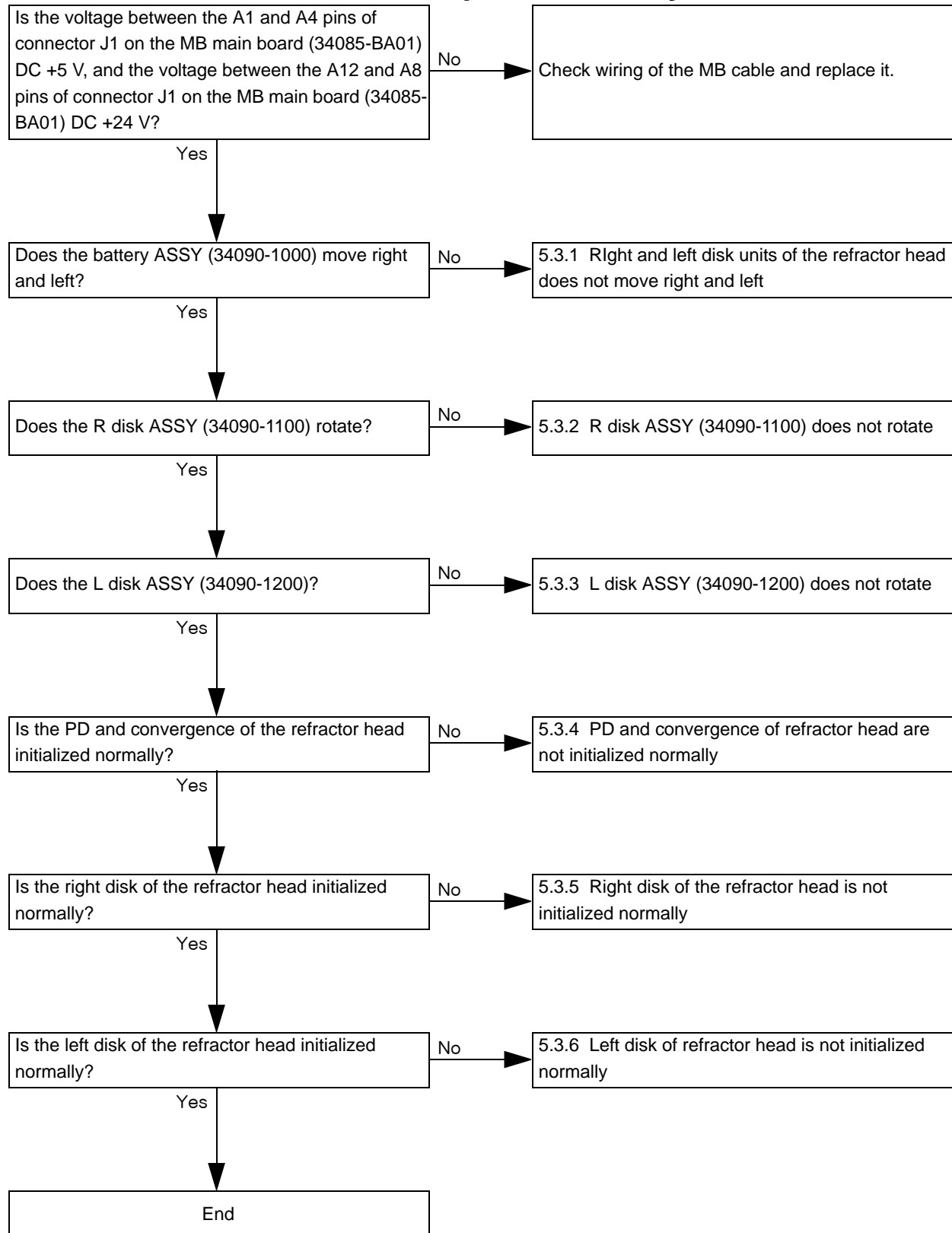
Replace the MB R board (34090-BA04) (see 7.2.3).

5.2.14 Error : L DRIVER VERSION

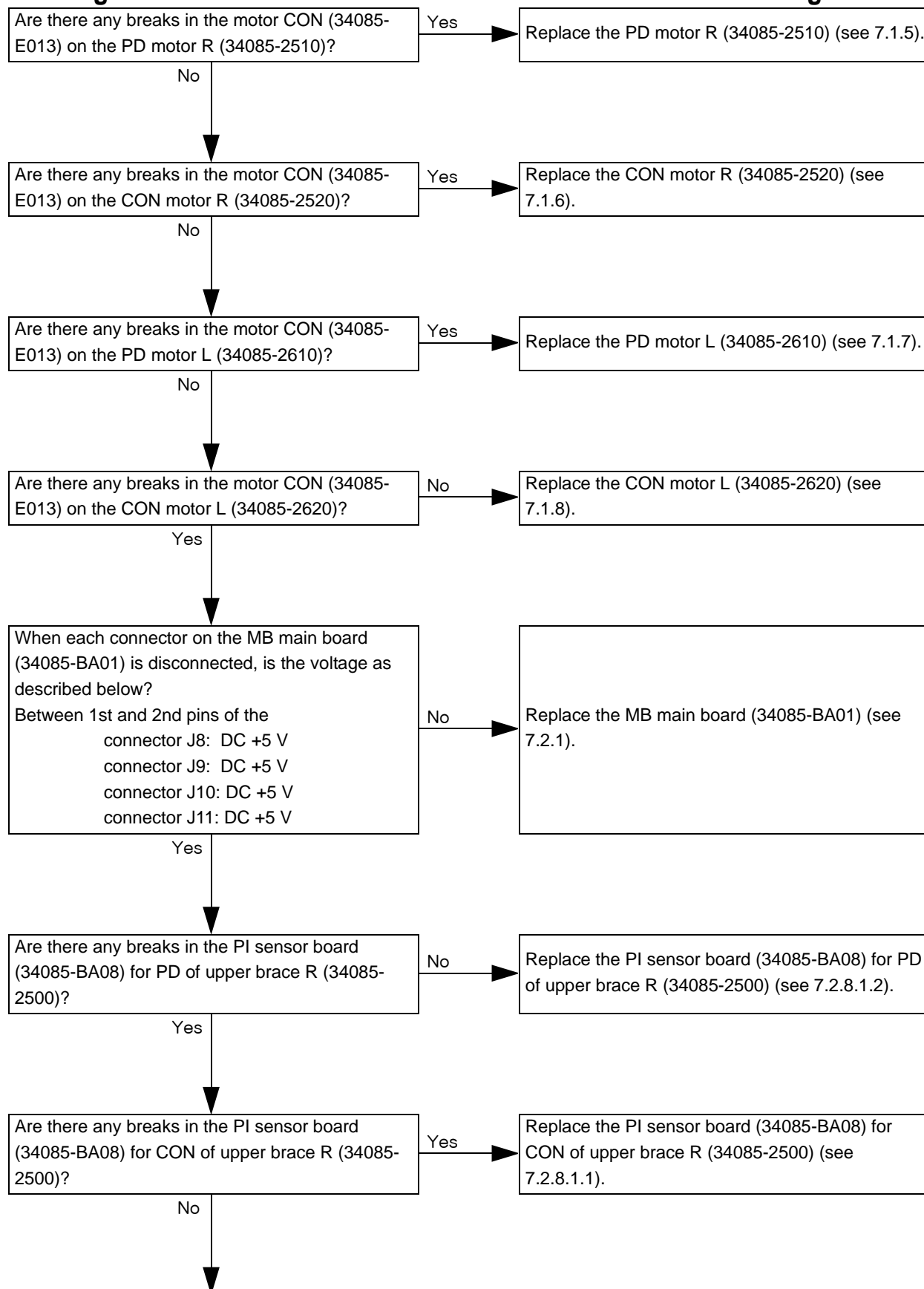
The version of the MB L board (34090-BA02) is not compatible to that of the MB main board (34085-BA01).

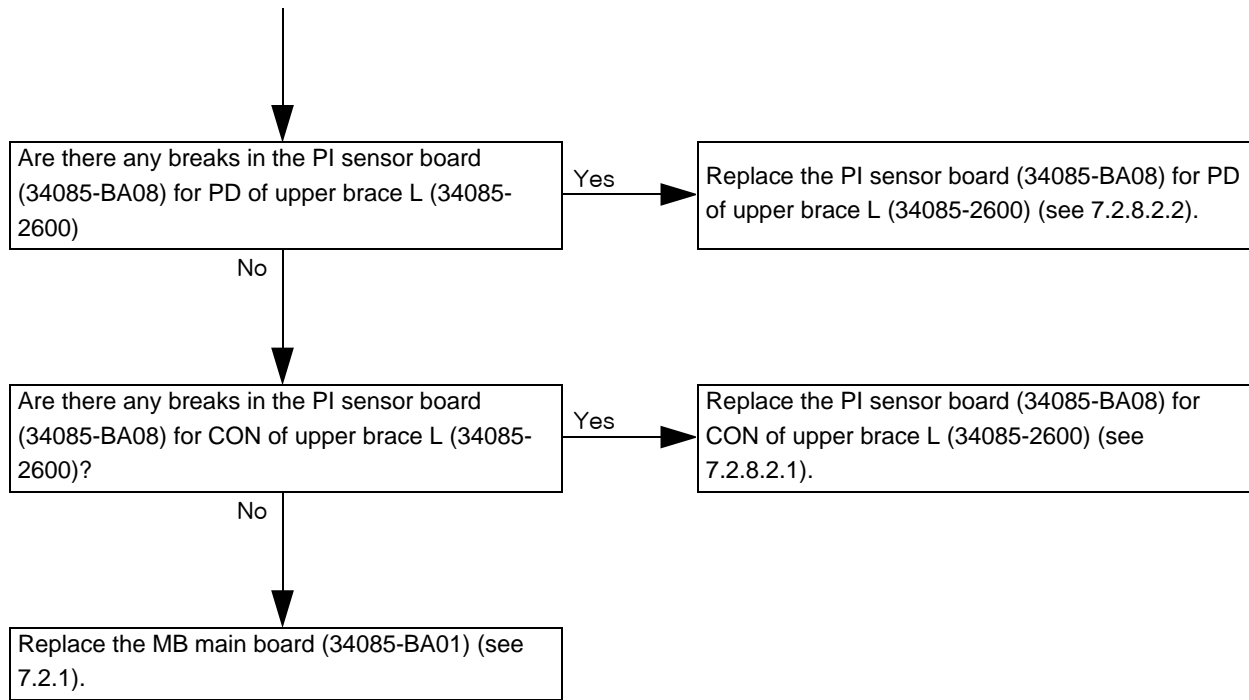
Replace the MB L board (34090-BA02) (see 7.2.2).

5.3 Initialization does not Complete Normally

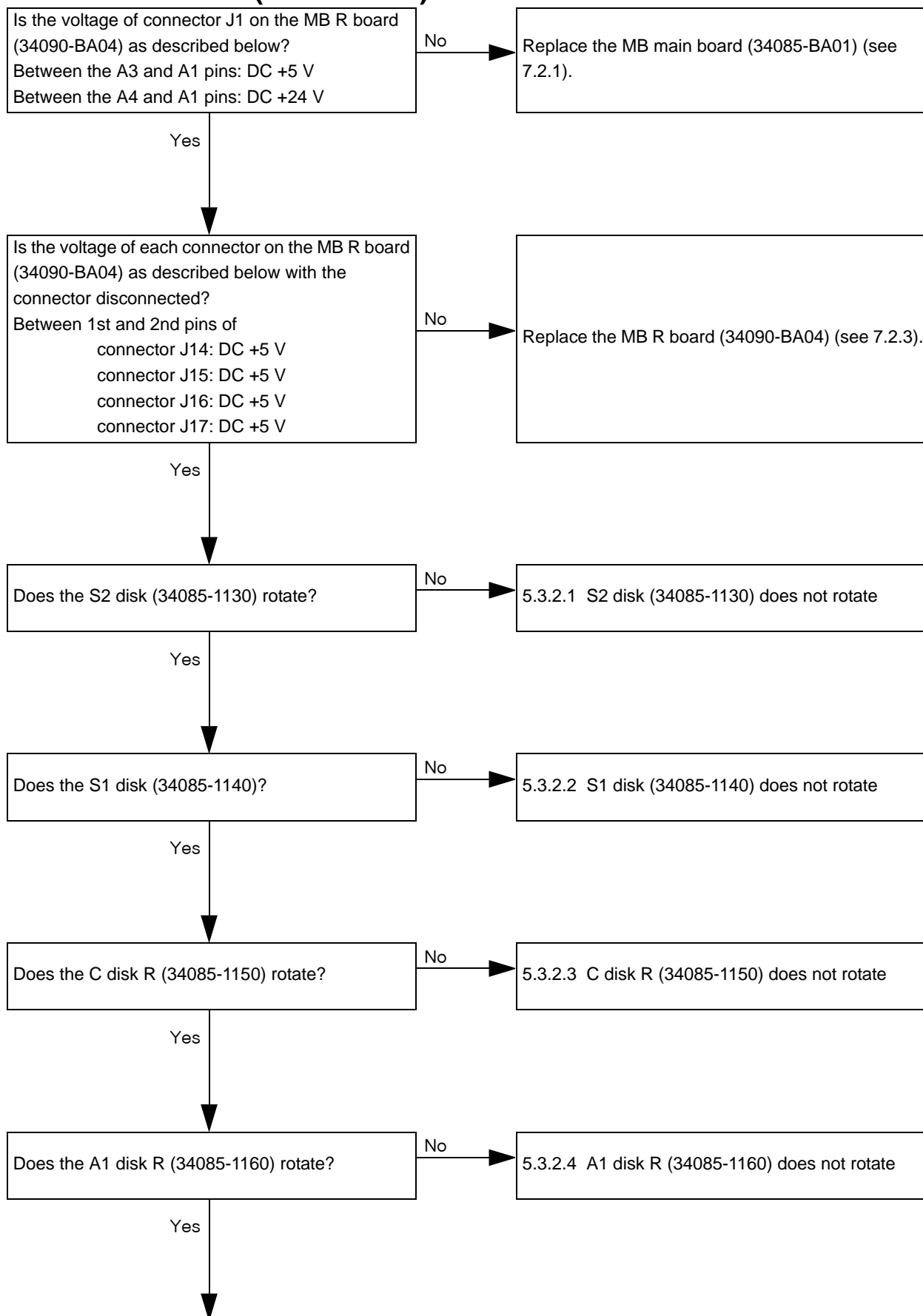


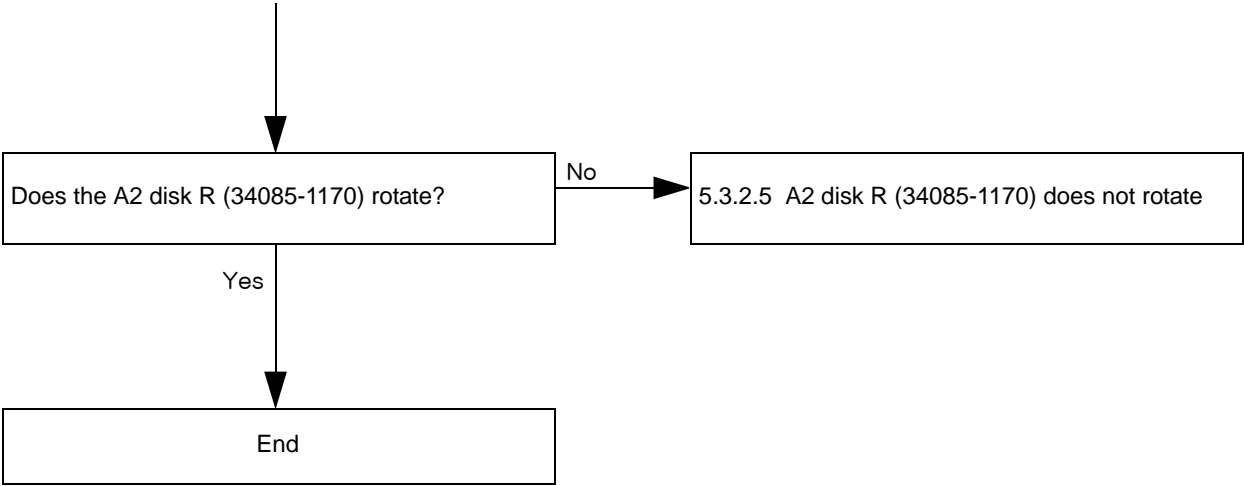
5.3.1 Right and left disk units of the refractor head does not move right and left



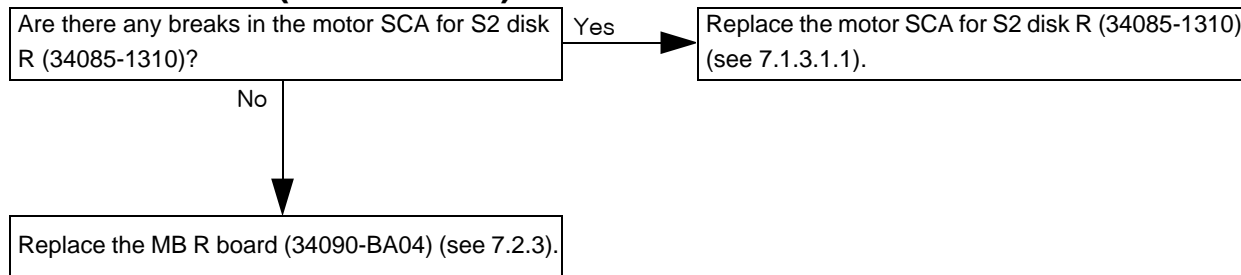


5.3.2 R disk ASSY (34090-1100) does not rotate

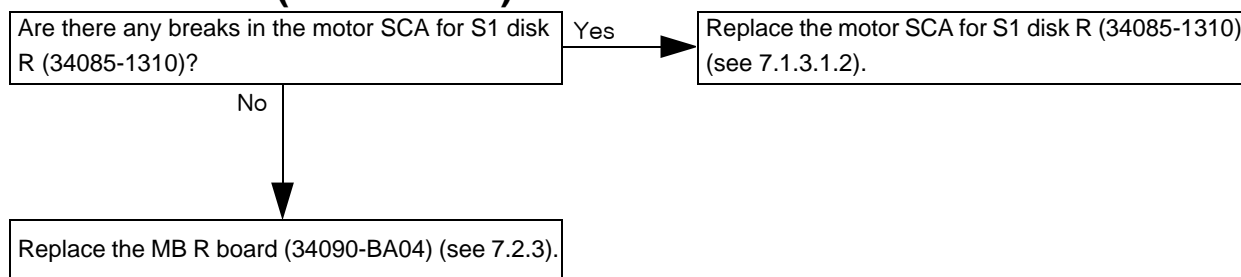




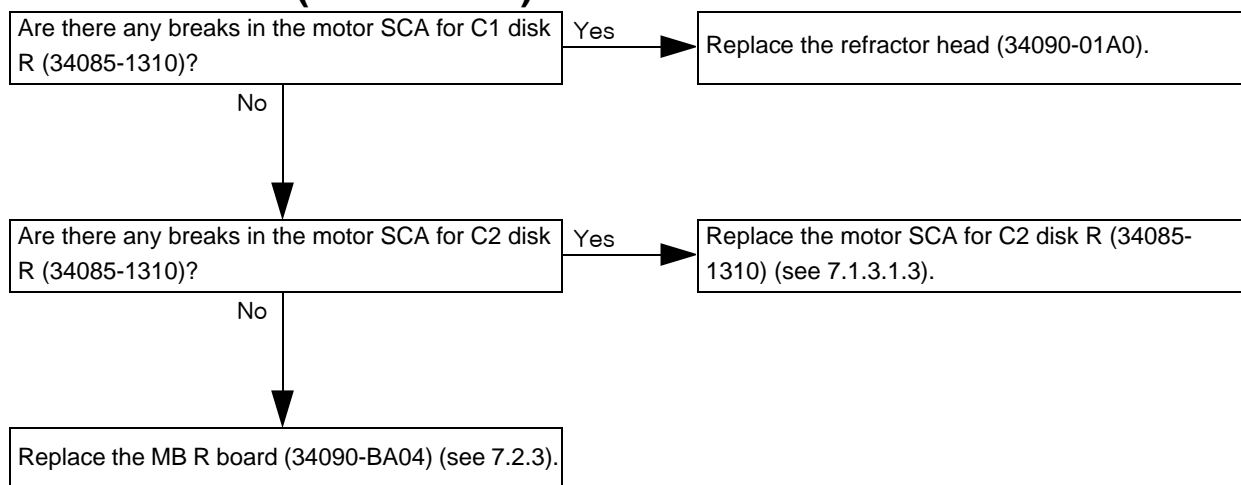
5.3.2.1 S2 disk (34085-1130) does not rotate



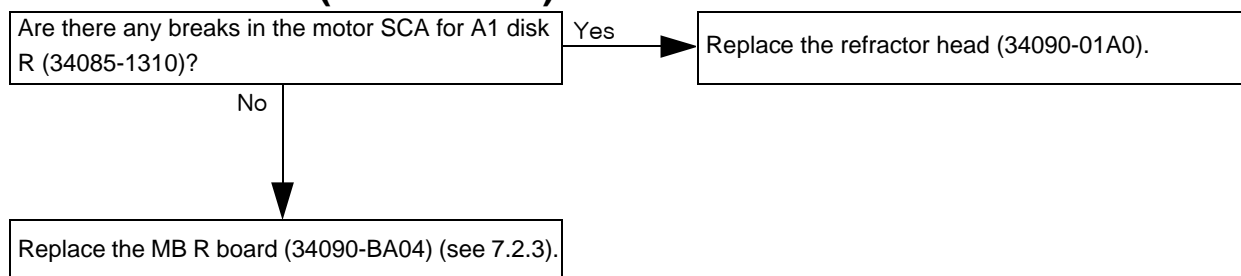
5.3.2.2 S1 disk (34085-1140) does not rotate



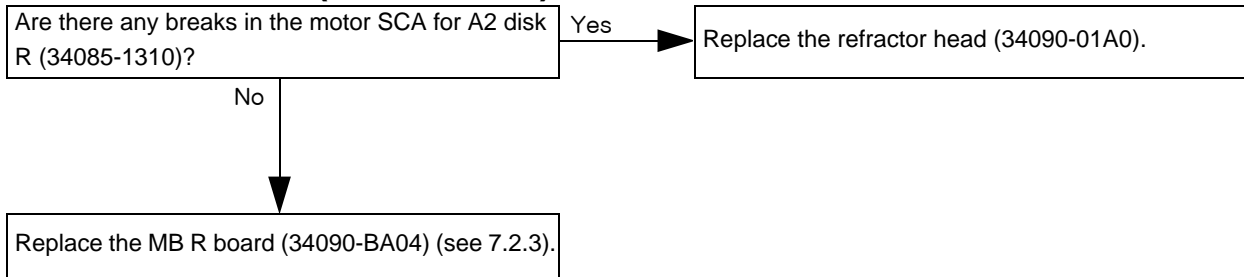
5.3.2.3 C disk R (34085-1150) does not rotate



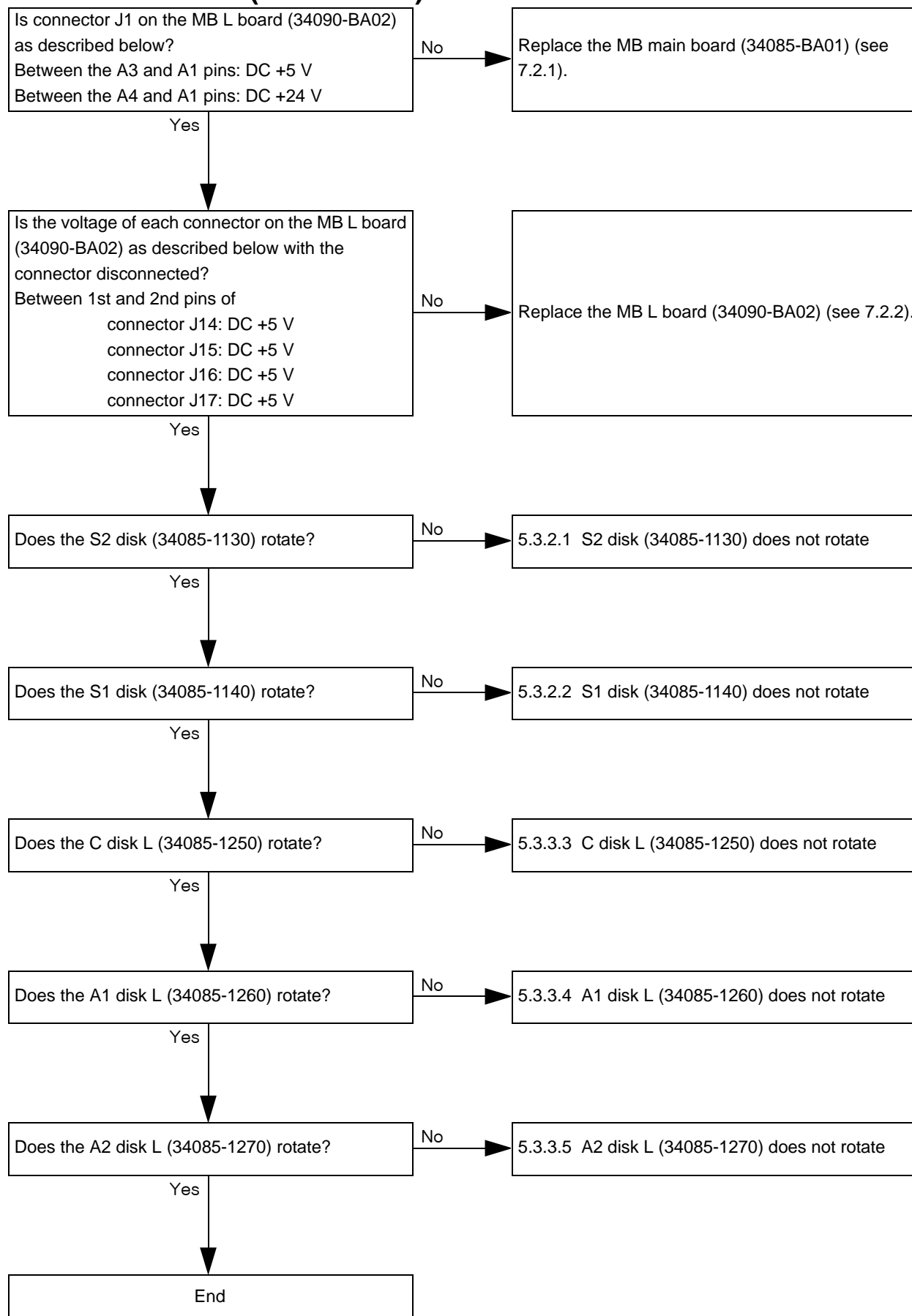
5.3.2.4 A1 disk R (34085-1160) does not rotate



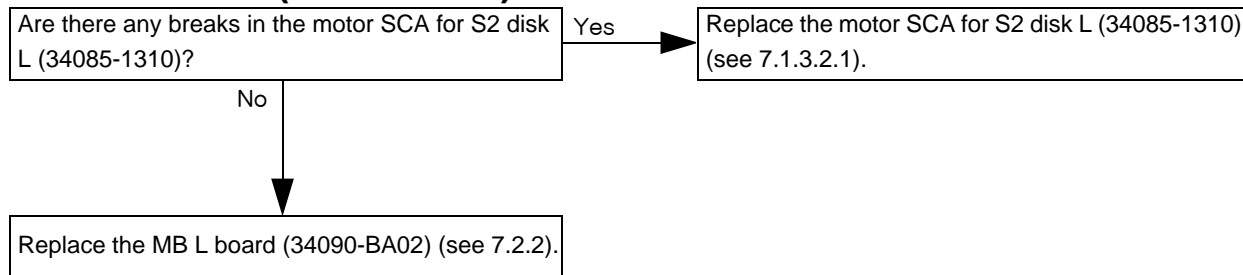
5.3.2.5 A2 disk R (34085-1170) does not rotate



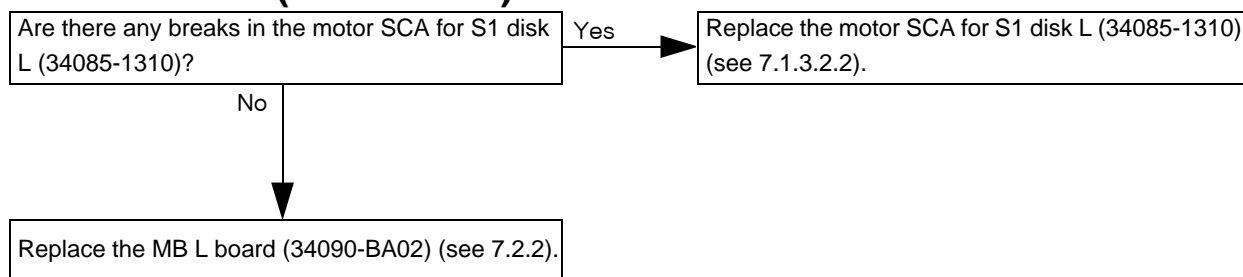
5.3.3 L disk ASSY (34090-1200) does not rotate



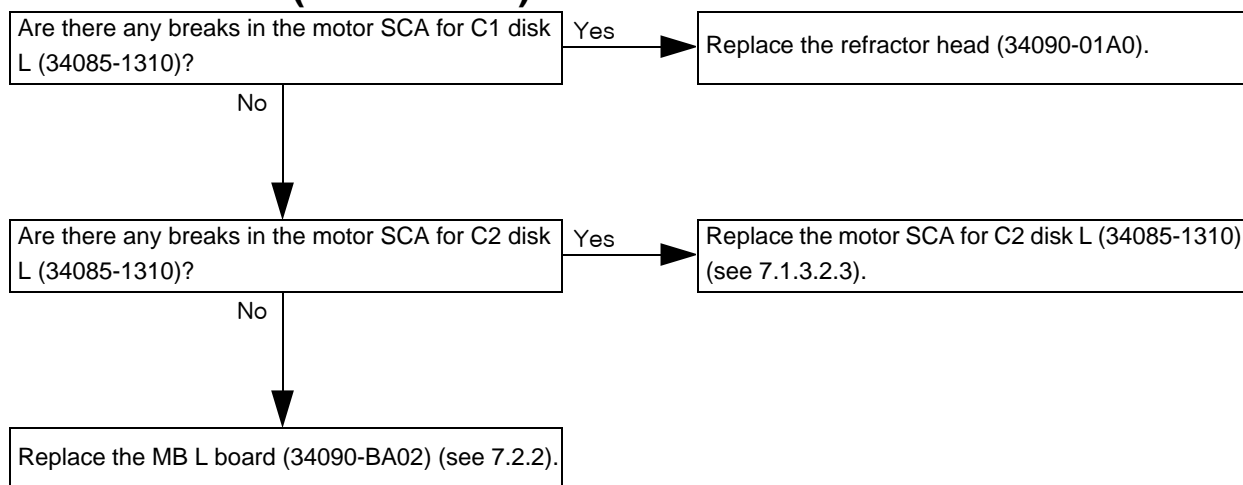
5.3.3.1 S2 disk (34085-1130) does not rotate



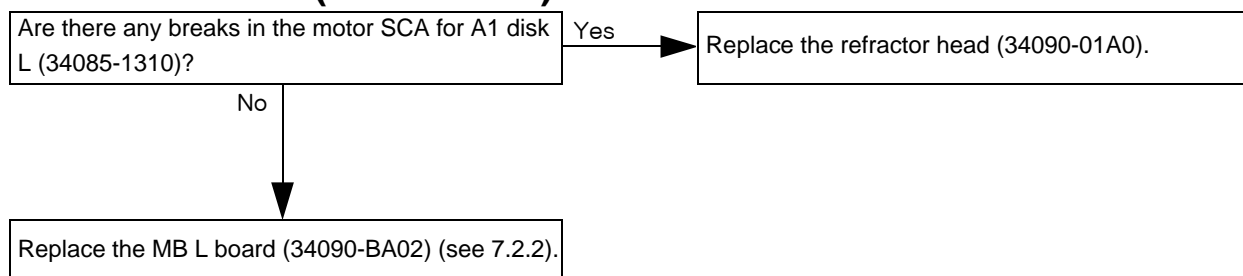
5.3.3.2 S1 disk (34085-1140) does not rotate



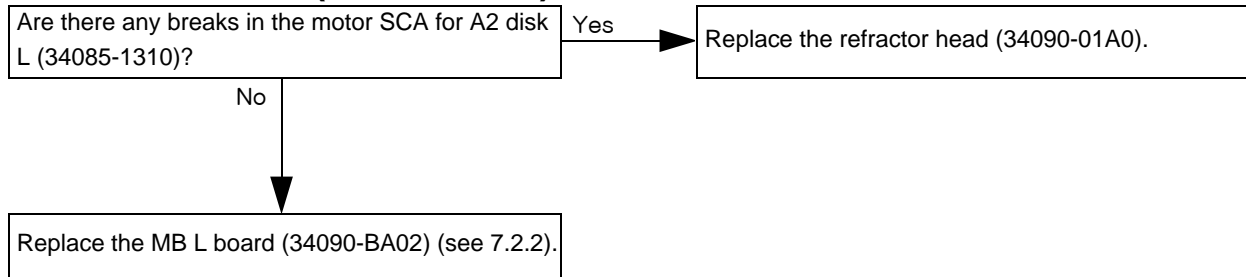
5.3.3.3 C disk L (34085-1250) does not rotate



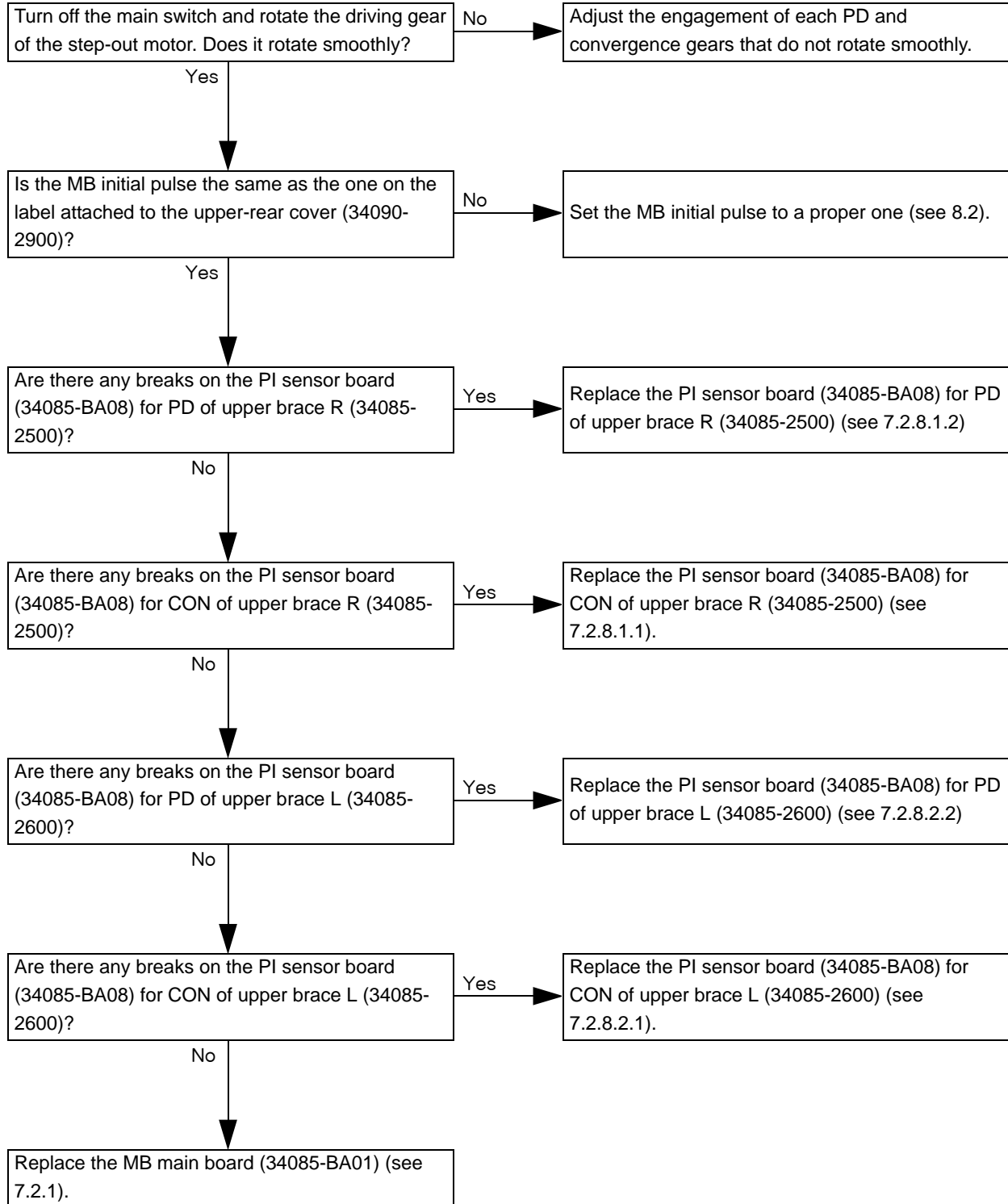
5.3.3.4 A1 disk L (34085-1260) does not rotate



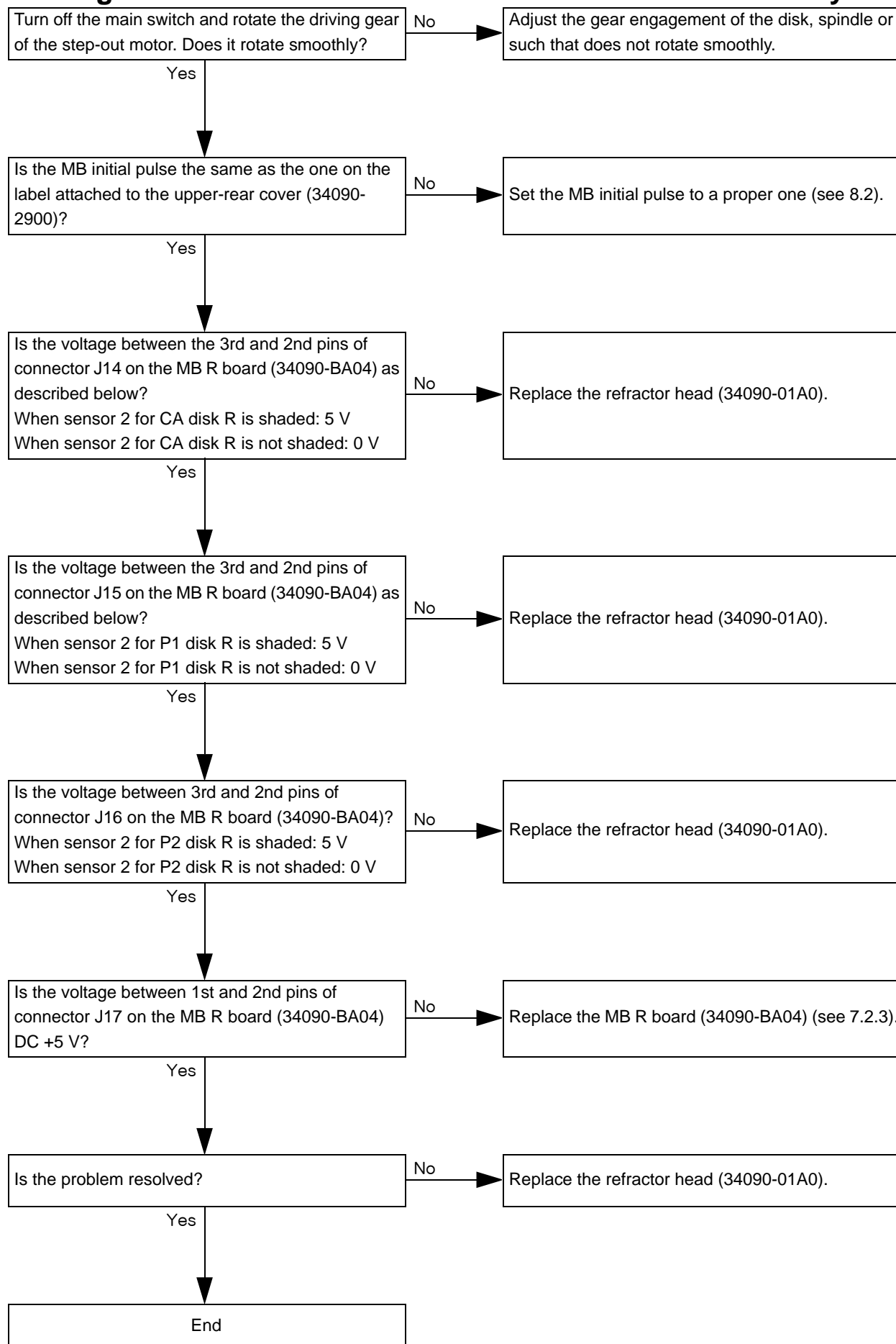
5.3.3.5 A2 disk L (34085-1270) does not rotate



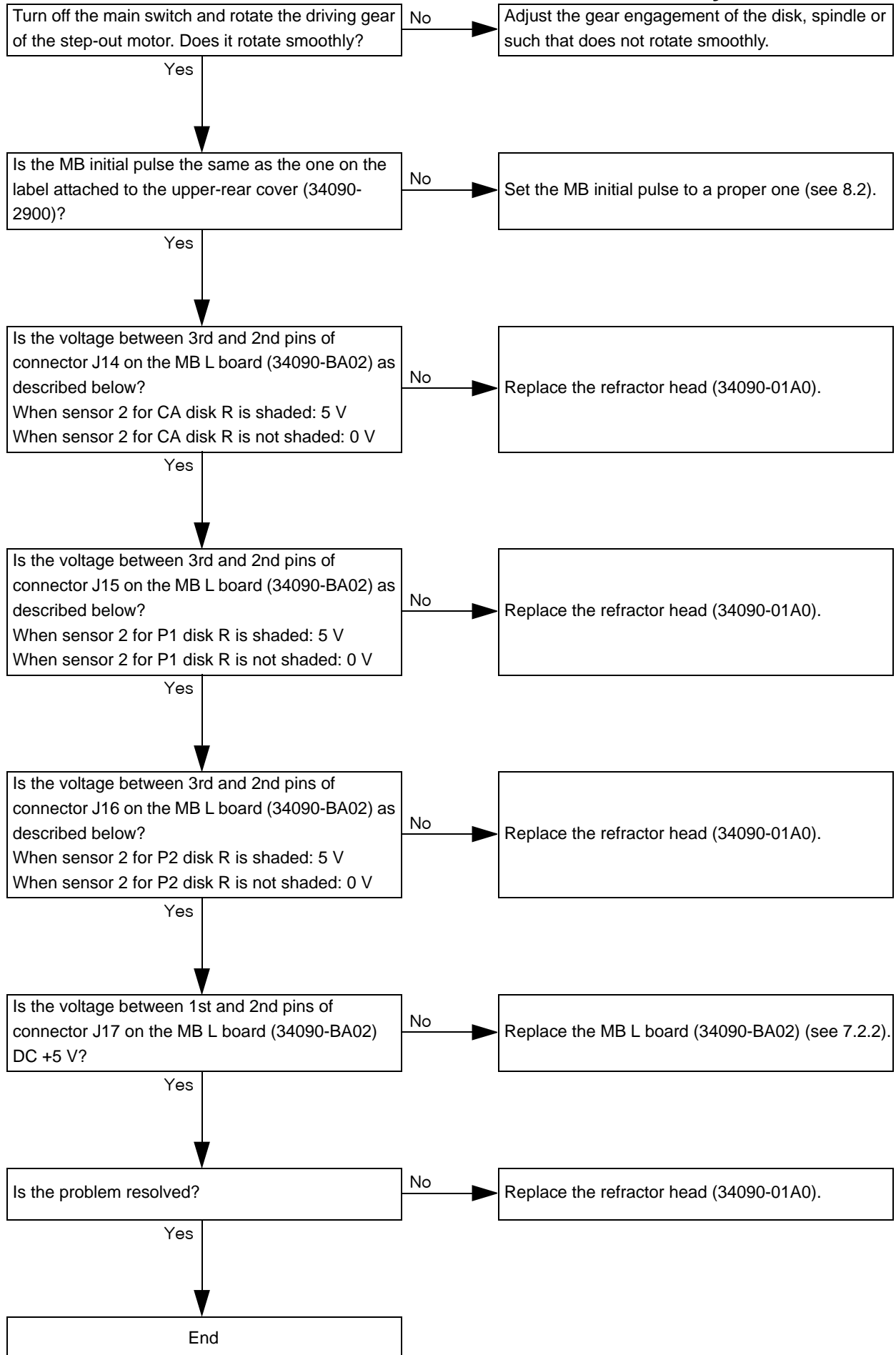
5.3.4 PD and convergence of refractor head are not initialized normally



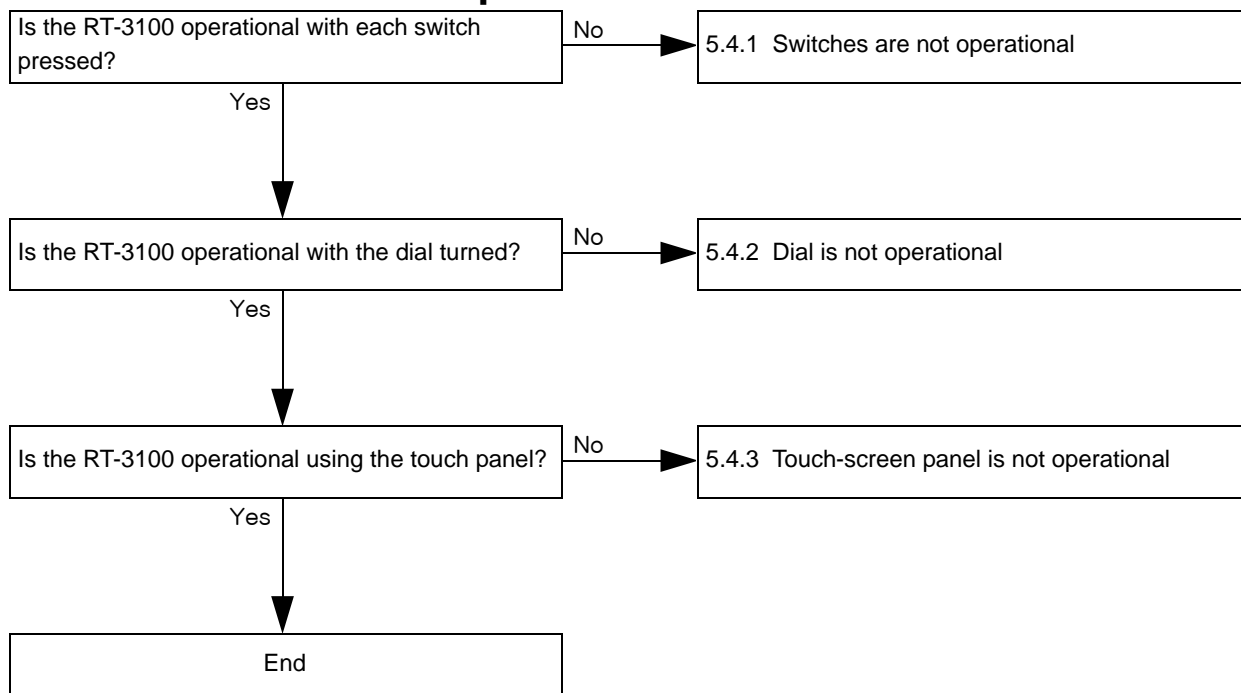
5.3.5 Right disk of the refractor head is not initialized normally



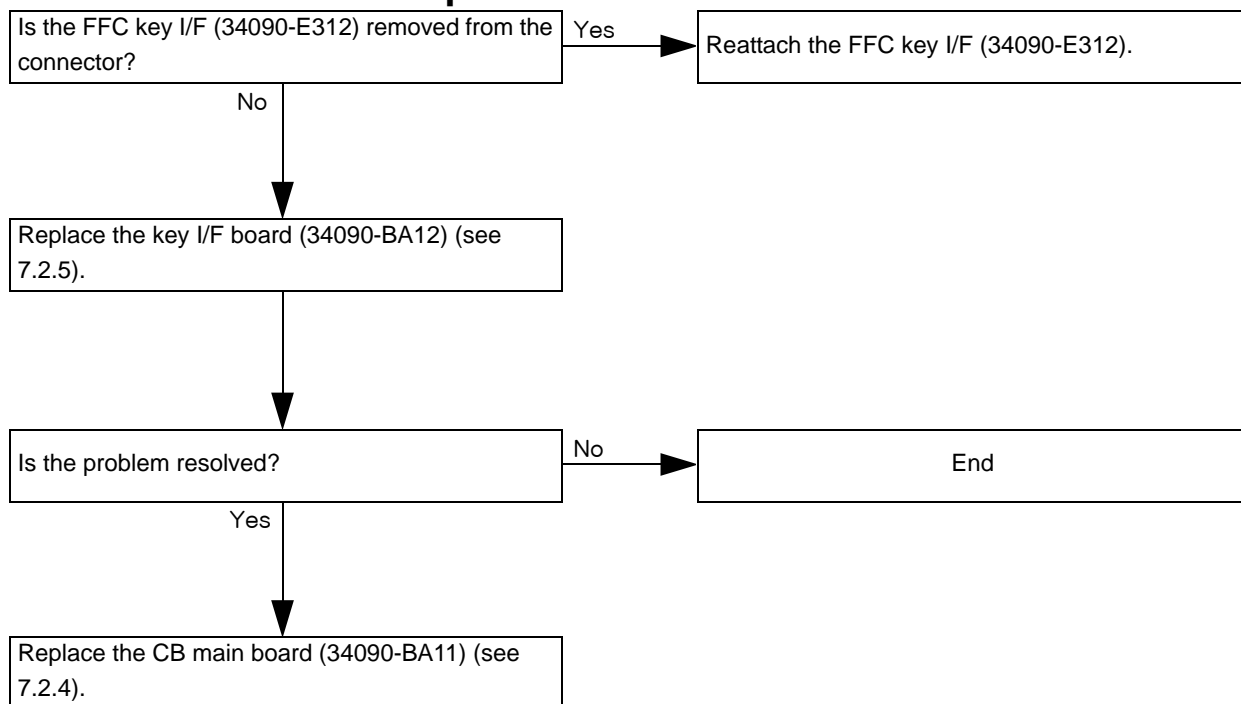
5.3.6 Left disk of refractor head is not initialized normally



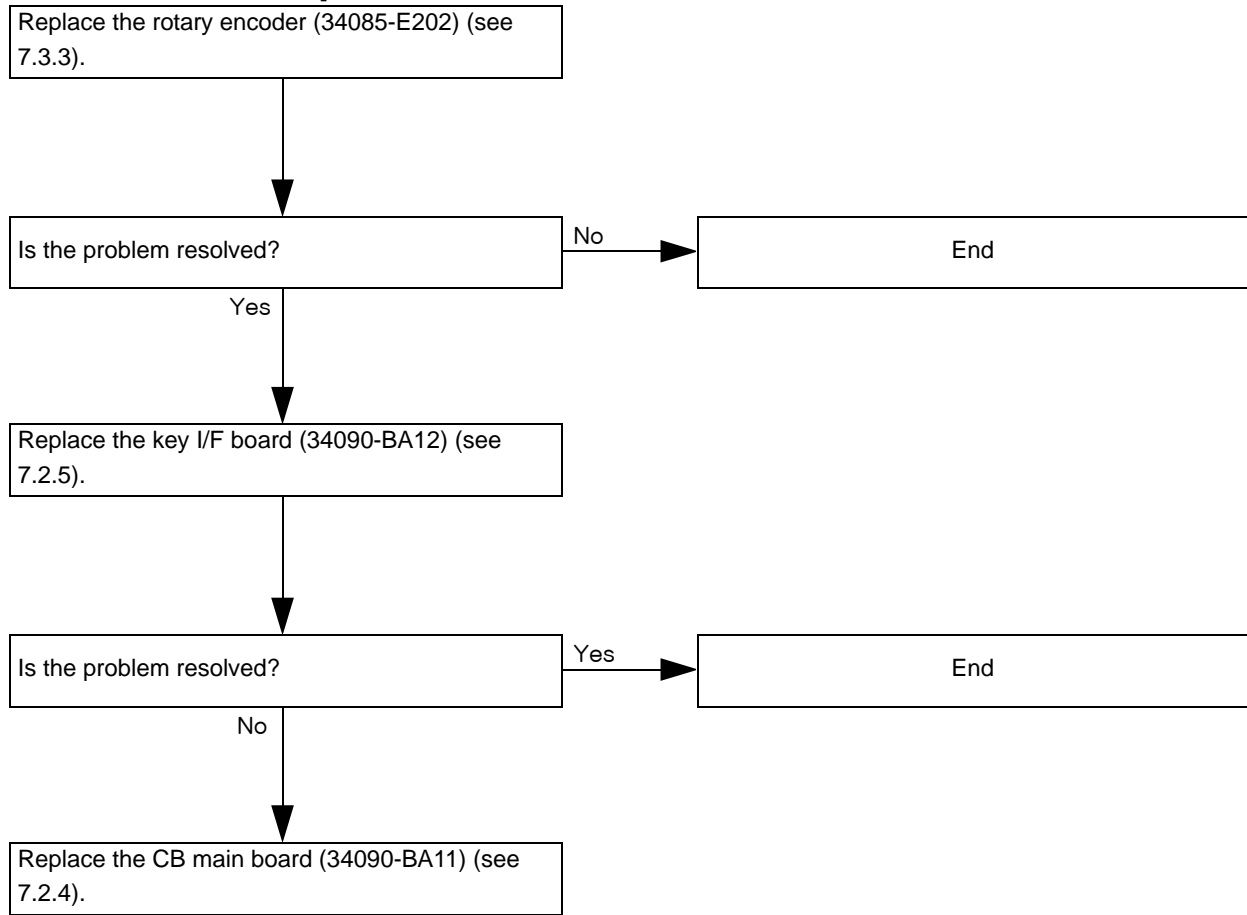
5.4 Control Box is not Operational



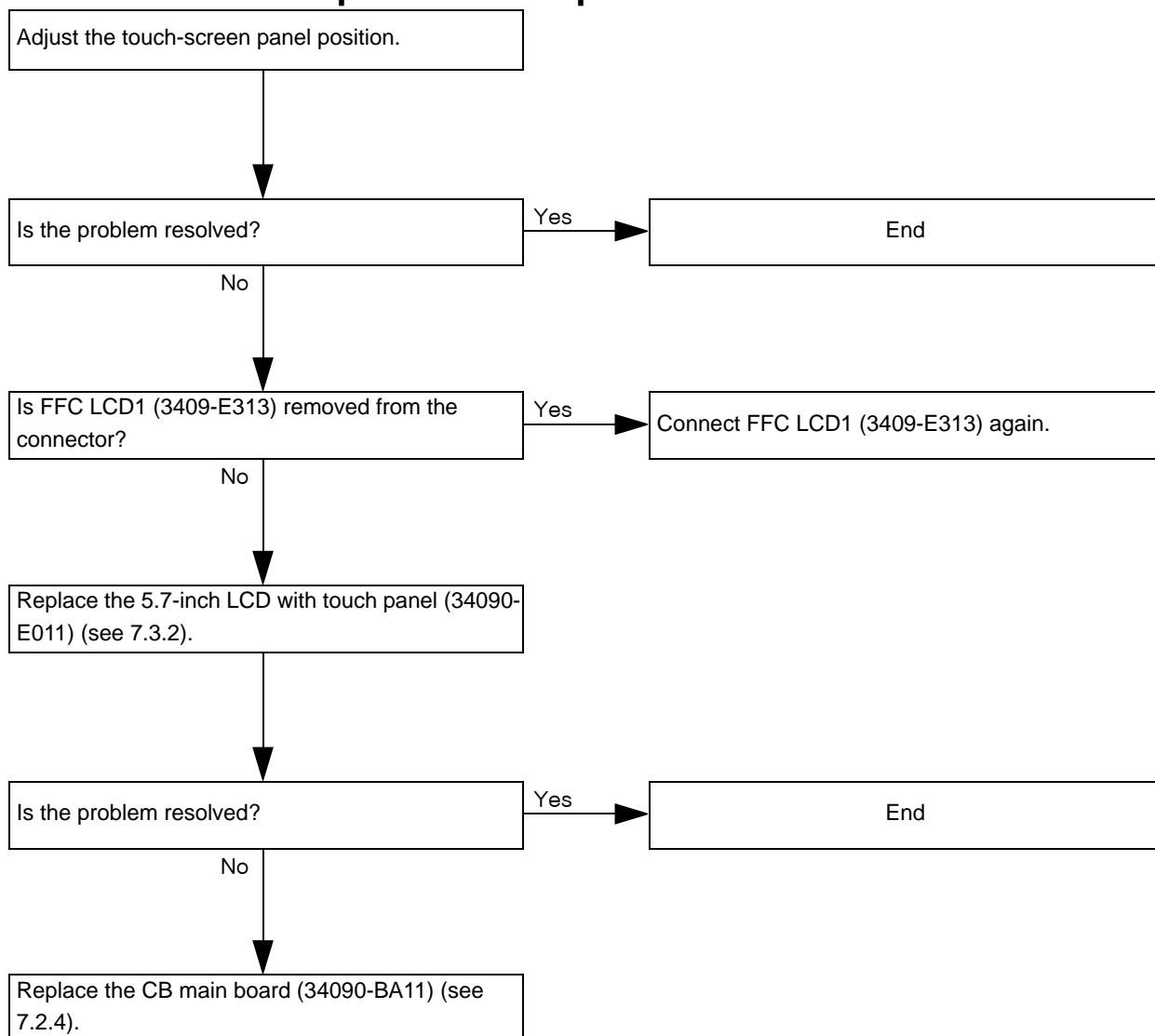
5.4.1 Switches are not operational



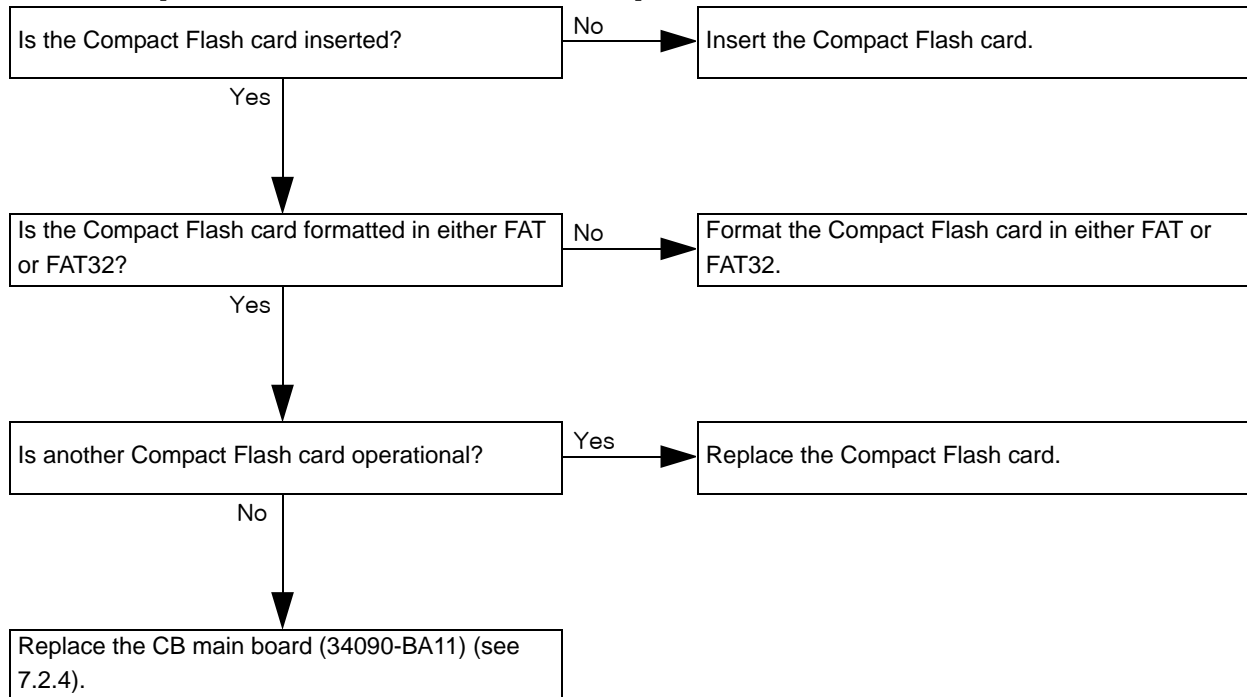
5.4.2 Dial is not operational



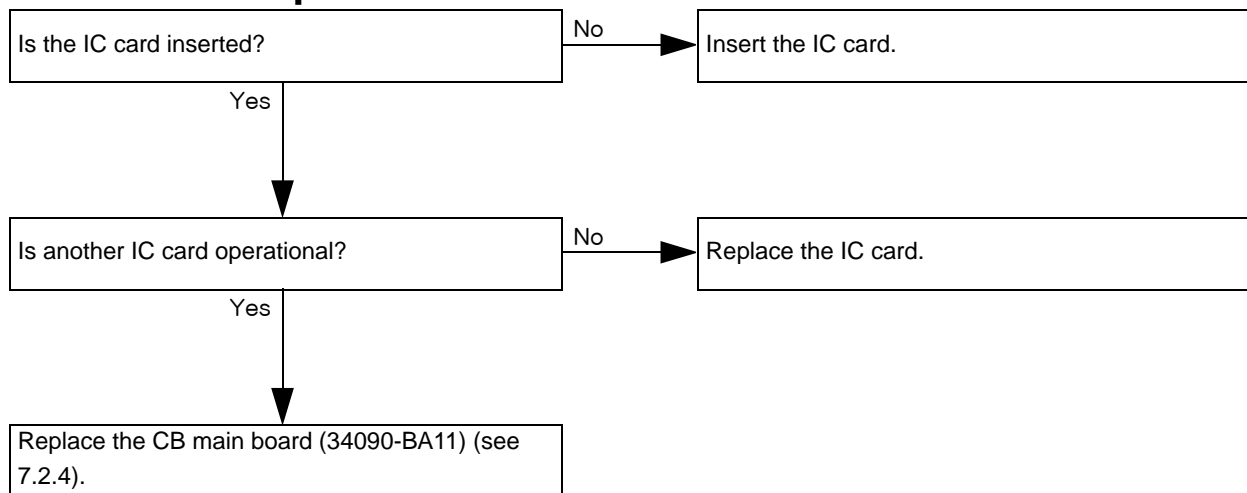
5.4.3 Touch-screen panel is not operational



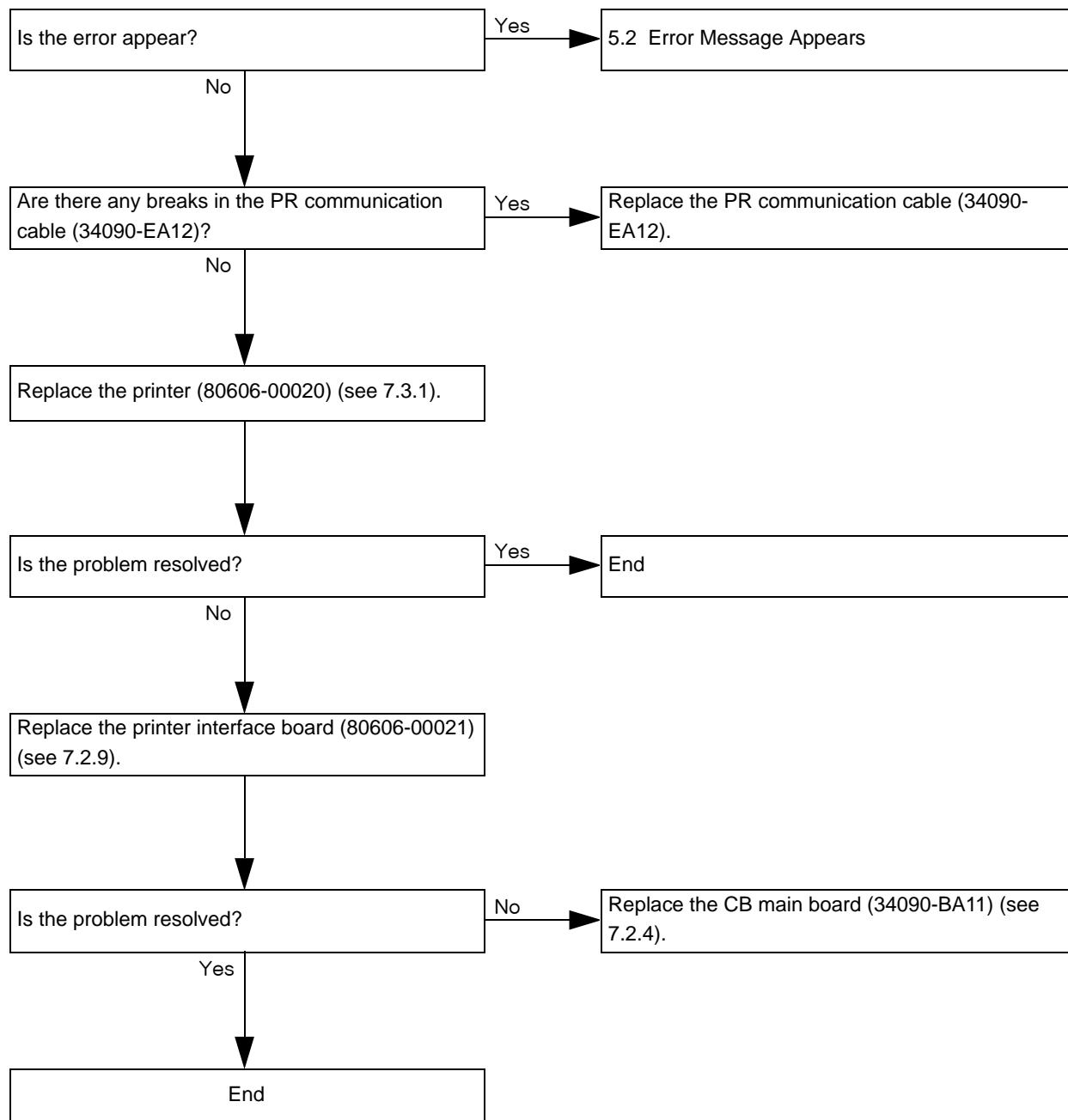
5.5 Compact Flash card is not operational



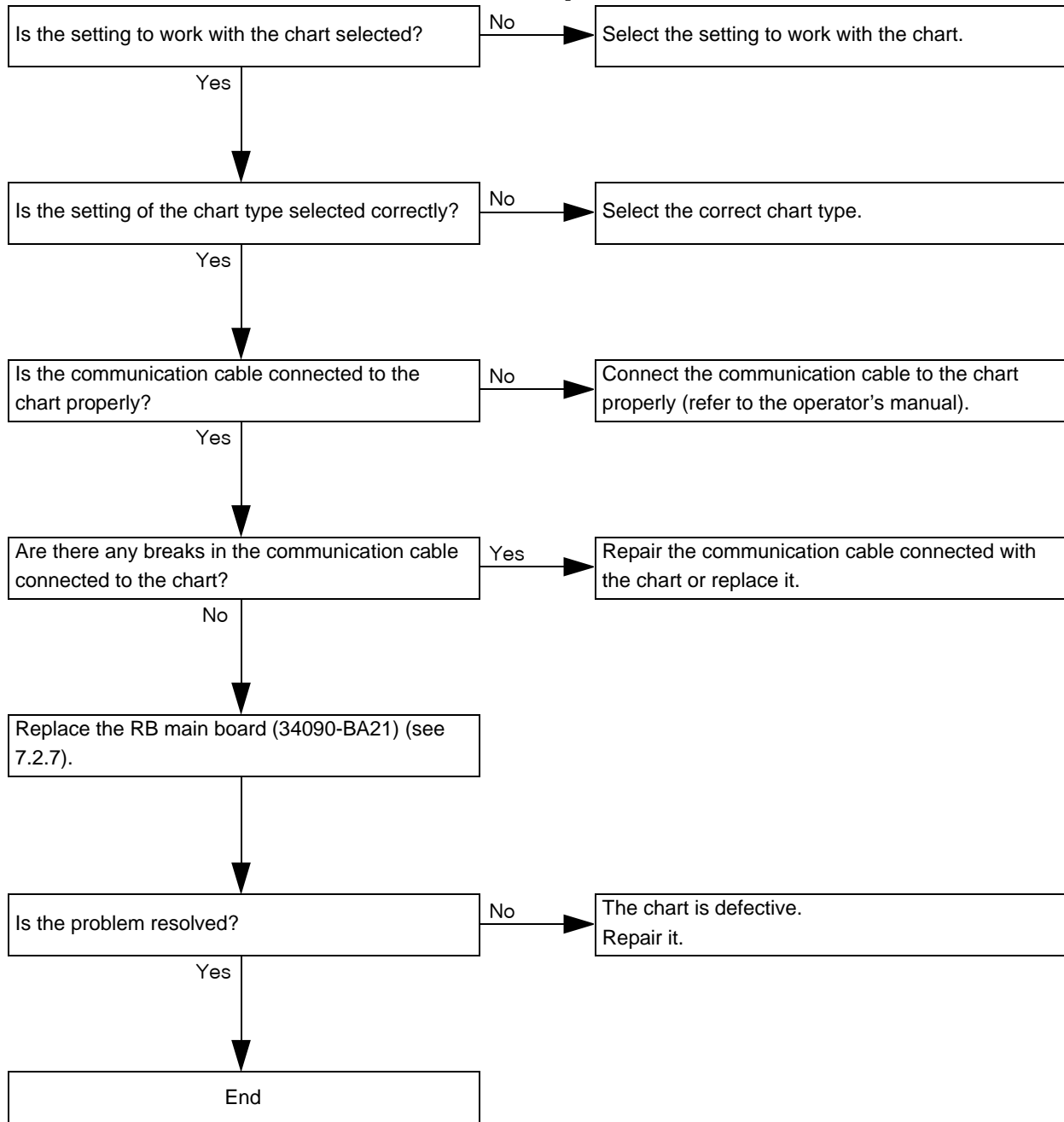
5.6 IC card is operational



5.7 Printer does not Print



5.8 Chart does not Function as Operated on Control Box

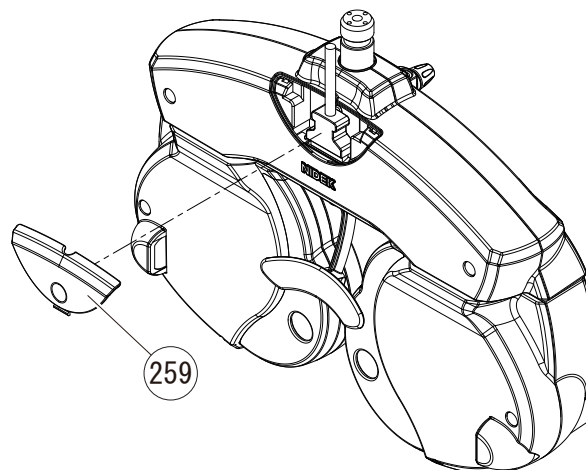


6 REMOVAL PROCEDURES

6.1 Refractor Head

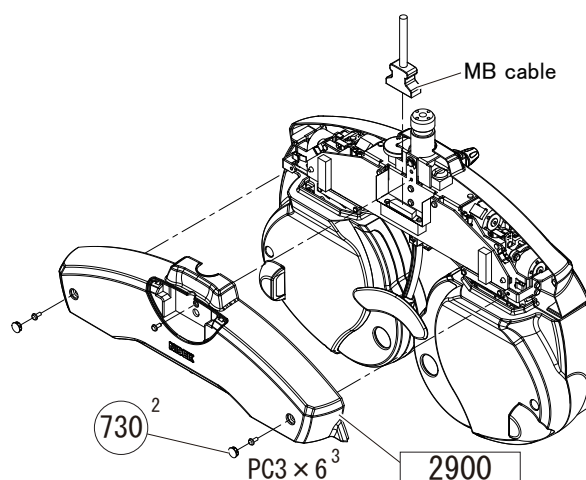
6.1.1 Upper cover J (34090-M259)

- 1 . Remove the upper cover J (34090-M259).
- 2 . Reassemble the removed parts in the reverse order.



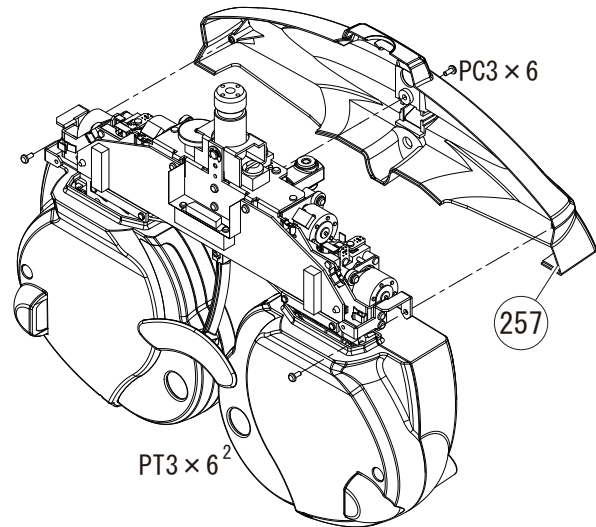
6.1.2 Upper-rear cover (34090-2900)

- 1 . Remove the upper cover J (34090-M259) (see 6.1.1).
- 2 . Remove the cap (32105-M730) (n = 2).
- 3 . Unscrew PC3 x 6 (n = 3) and remove the upper-rear cover (34090-2900).
- 4 . Reassemble the removed parts in the reverse order.



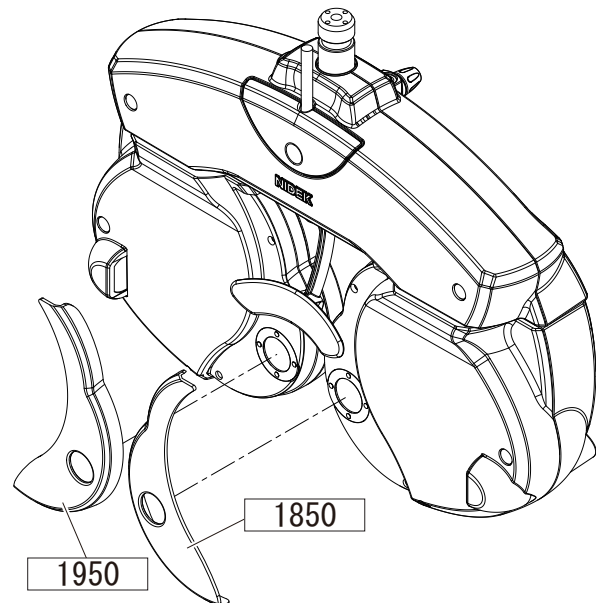
6.1.3 Upper cover F (34090-M257)

- 1 . Remove the upper-rear cover (34090-2900) (see 6.1.2).
- 2 . Unscrew PC3 x 6 and PT3 x 6 (n = 2), and then remove the upper cover F (34090-M257).
- 3 . Reassemble the removed parts in the reverse order.



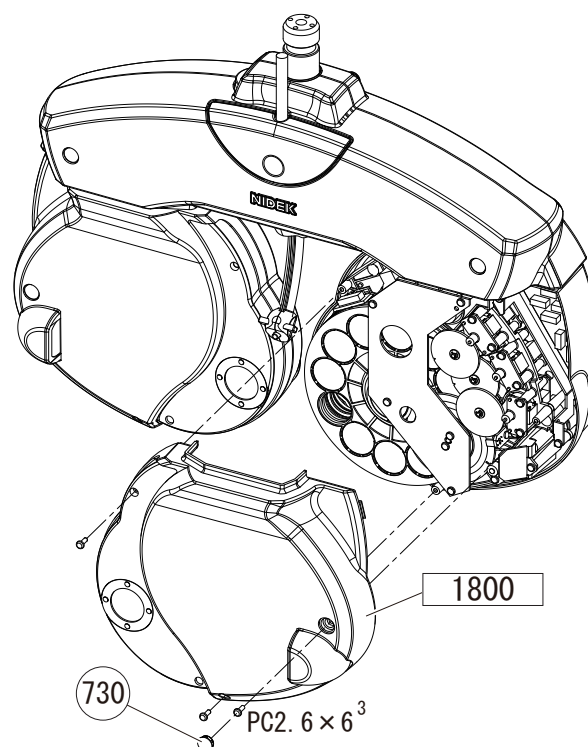
6.1.4 Face shield R (34090-1850), Face shield L (34090-1950)

- 1 . Remove the face shield R (34090-1850) and face shield L (34090-1950).
- 2 . Reassemble the removed parts in the reverse order.



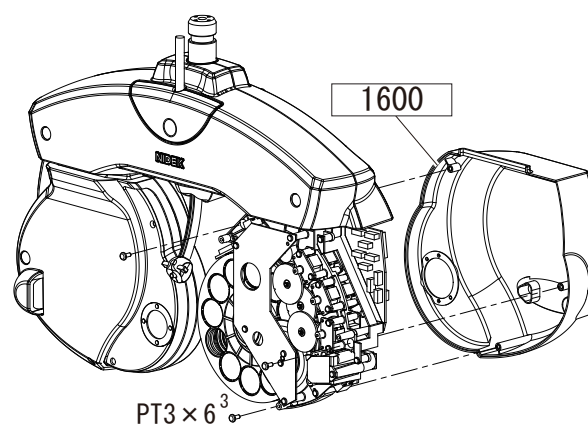
6.1.5 Rear cover R (34090-1800)

- 1 . Remove the face shield R (34090-1850) (see 6.1.4).
- 2 . Remove the cap (32105-M730) (n = 2).
- 3 . Unscrew PC2.6 x 6 (n = 3) and remove the rear cover R (34090-1800).
- 4 . Reassemble the removed parts in the reverse order.



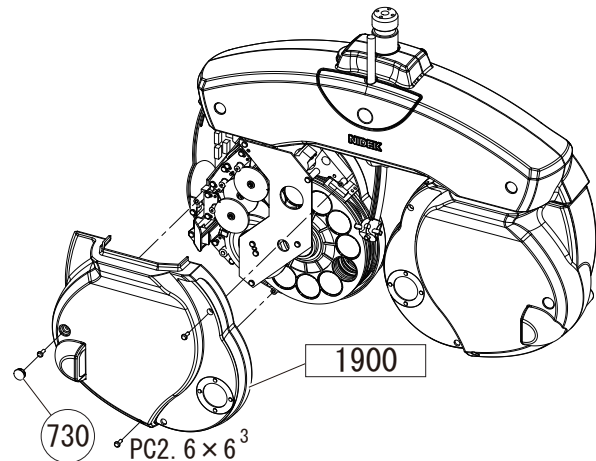
6.1.6 Front cover R (34090-1600)

- 1 . Remove the rear cover R (34090-1800) (see 6.1.5).
- 2 . Unscrew PT3 x 6 (n = 3) and remove the front cover R (34090-1600).
- 3 . Reassemble the removed parts in the reverse order.



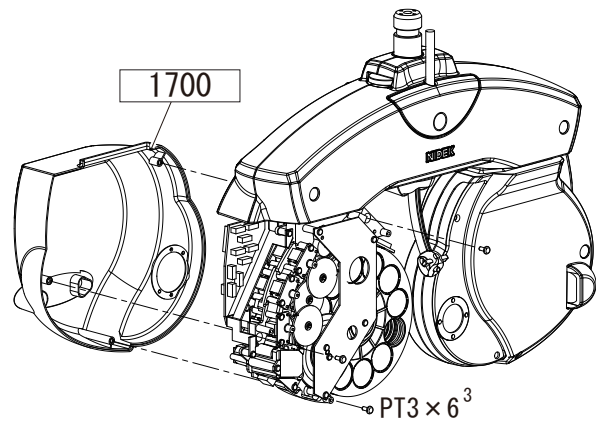
6.1.7 Rear cover L (34090-1900)

- 1 . Remove the face shield R (34090-1850) (see 6.1.4).
- 2 . Remove the cap (32105-M730) (n = 2).
- 3 . Unscrew PC2.6 x 6 (n = 3) and remove the rear cover L (34090-1900).
- 4 . Reassemble the removed parts in the reverse order.



6.1.8 Front cover L (34090-1700)

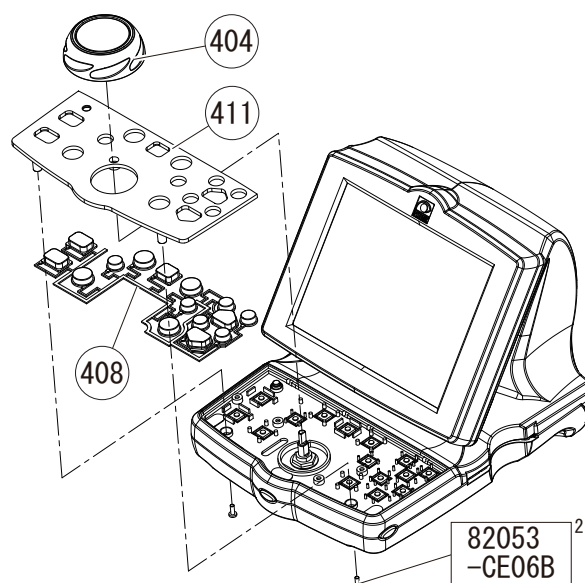
- 1 . Remove the rear cover R (34090-1800) (see 6.1.5).
- 2 . Unscrew PT3 x 6 (n = 3) and remove the front cover L (34090-1700).
- 3 . Reassemble the removed parts in the reverse order.



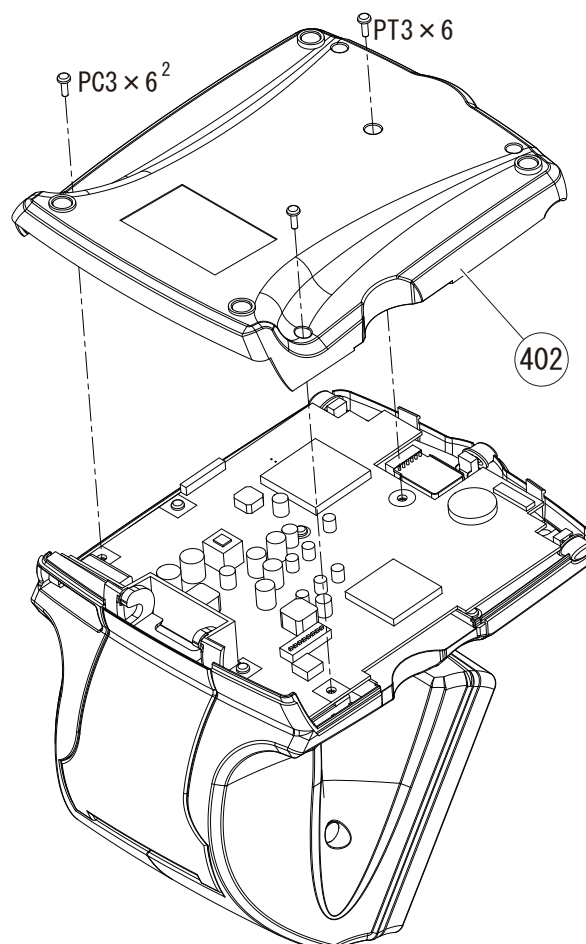
6.2 Control Box

6.2.1 Lower cover (34090-M402)

- 1 . Remove the knob (34090-M404) together with the cap (34090-M405).
- 2 . Unscrew 82053-CE06B (n = 2). Then, remove the panel (34090-M411) and key top (34090-M408).
- 3 . Unscrew PC3 x 6 (n = 2) and PT3 x 6, and then remove the cover (34090-M402).

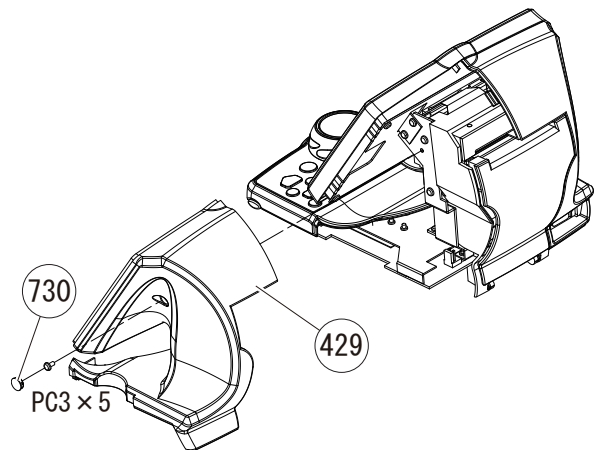


- 4 . Unscrew PC3 x 3 (n = 2) and TP3 x 6, and then remove the lower cover (34090-M402).
- 5 . Reassemble the removed parts in the reverse order.



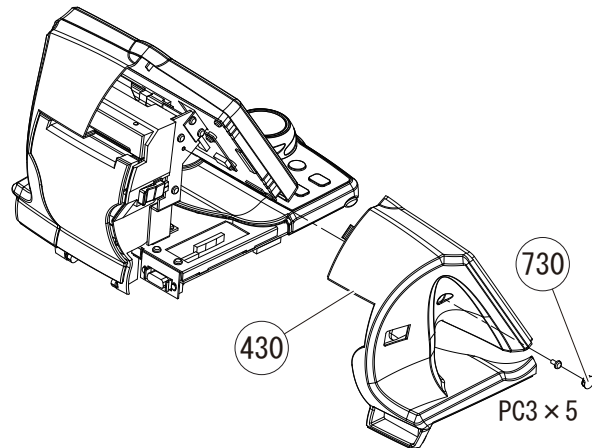
6.2.2 cover R (34090-M429)

- 1 . Remove the cap (32105-M730) (n = 2).
- 2 . Unscrew PC3 x 5 and remove the cover R (34090-M429).
- 3 . Reassemble the removed parts in the reverse order.



6.2.3 Cover L (34090-M430)

- 1 . Remove the cap (32105-M730) (n = 2).
- 2 . Unscrew PC3 x 5 and remove the cover R (34090-M429).
- 3 . Reassemble the removed parts in the reverse order.



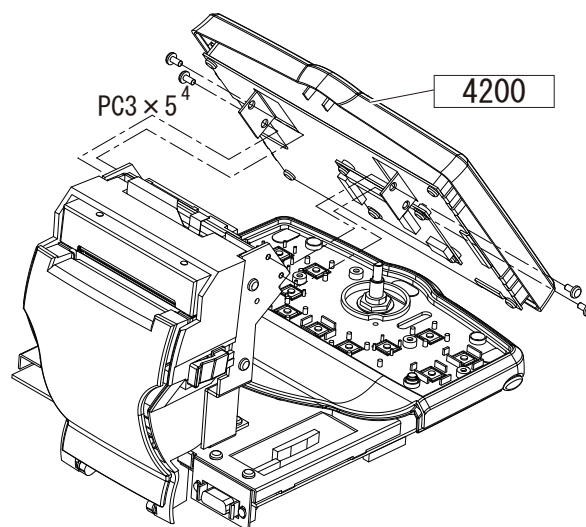
7 REPLACEMENT PROCEDURES

7.1 ASSYs

7.1.1 LCD ASSY (34090-4200)

Replacement part: 34090-4200

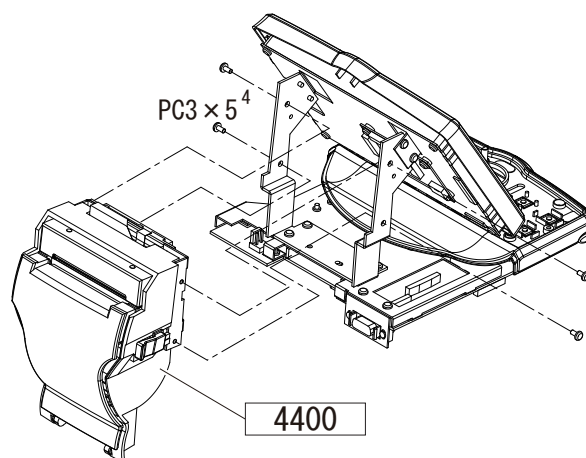
- 1 . Remove the control box cover (see 6.2).
- 2 . Disconnect connector J3 from the CB main board (34090-BA11).
- 3 . Unscrew PC3 x 5 (n = 4) and remove the LCD ASSY (34090-4200).
- 4 . Reassemble the removed parts in the reverse order.



7.1.2 Printer ASSY (34090-4400)

Replacement part: 34090-4400

- 1 . Remove the control box cover (see 6.2).
- 2 . Disconnect connector P6 (J6) and P21 (J21) from the CB main board (34090-BA11).
- 3 . Unscrew PC3 x 5 (n = 4) and replace the printer ASSY (34090-4400).
- 4 . Reassemble the removed parts in the reverse order.



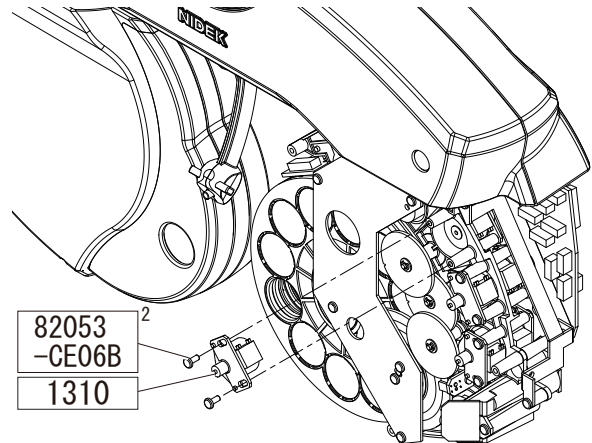
7.1.3 Motor SCA (34085-1310)

7.1.3.1 Motor SCA in Frame R (34090-1300)

7.1.3.1.1 Motor SCA for S2 disk

Replacement part: 34085-1310

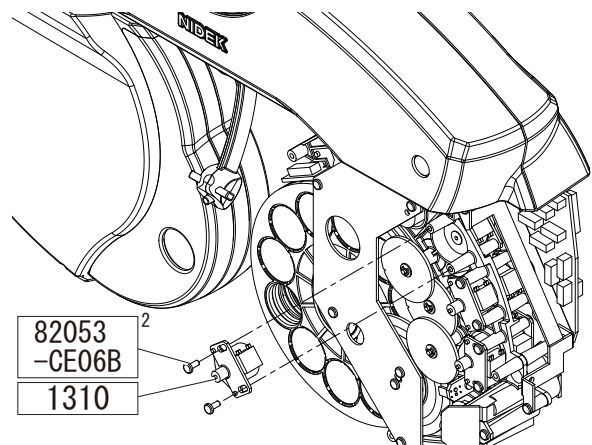
- 1 . Remove the front cover R (34090-1600) (see 6.1.6).
- 2 . Disconnect connector J2 from the MB R board (34090-BA04).
- 3 . Remove the P tight screws (82053-CE06B) (n = 2) and replace the motor SCA (34085-1310).
- 4 . Reassemble the removed parts in the reverse order.



7.1.3.1.2 Motor SCA for S1 disk

Replacement part: 34085-1310

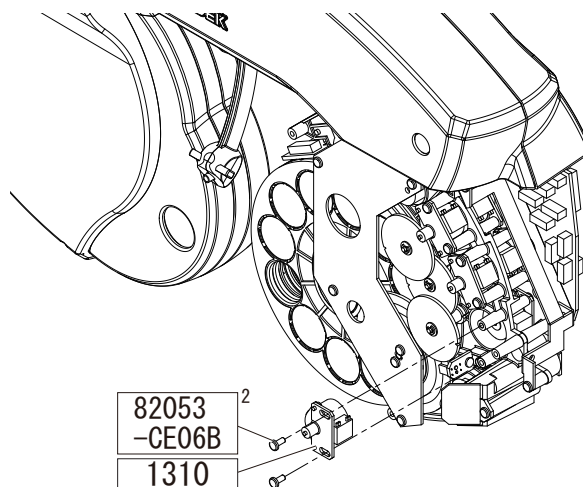
- 1 . Remove the front cover R (34090-1600) (see 6.1.6).
- 2 . Disconnect connector J3 from the MB R board (34090-BA04)
- 3 . Remove the P tight screws (82053-CE06B) (n = 2) and replace the motor SCA (34085-1310).
- 4 . Reassemble the removed parts in the reverse order.



7.1.3.1.3 Motor SCA for C2 disk

Replacement part: 34085-1310

- 1 . Remove the front cover R (34090-1600) (see 6.1.6).
- 2 . Disconnect connector J4 from the MB R board (34090-BA04).
- 3 . Remove the P tight screws (82053-CE06B) (n = 2) and replace the motor SCA (34085-1310).
- 4 . Reassemble the removed parts in the reverse order.

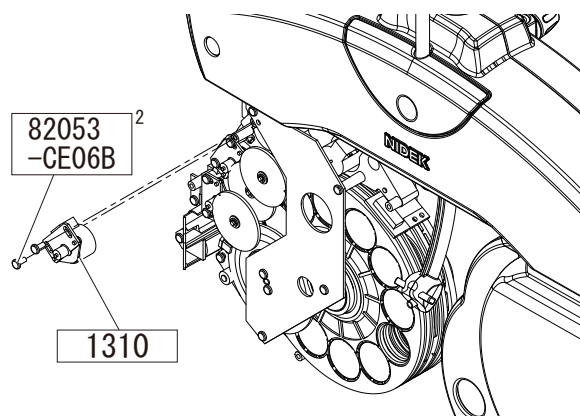


7.1.3.2 Motor SCA in frame L (34090-1400)

7.1.3.2.1 Motor SCA for S2 disk

Replacement part: 34085-1310

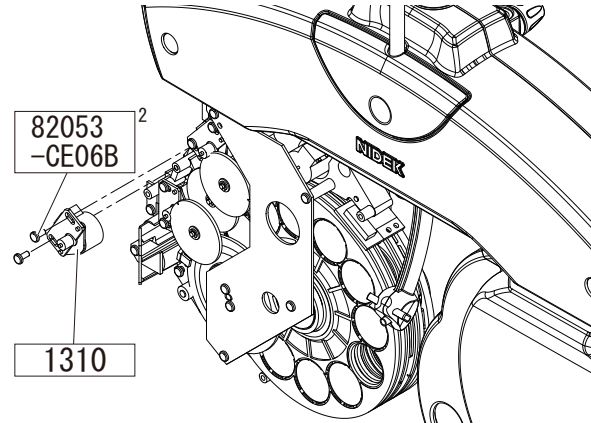
- 1 . Remove the front cover L (34090-1700) (see 6.1.8).
- 2 . Disconnect connector J2 from the MB L board (34090-BA02).
- 3 . Remove the P tight screws (82053-CE06B) (n = 2) and replace the motor SCA (34085-1310).
- 4 . Reassemble the removed parts in the reverse order.



7.1.3.2.2 Motor SCA for S1 disk

Replacement part: 34085-1310

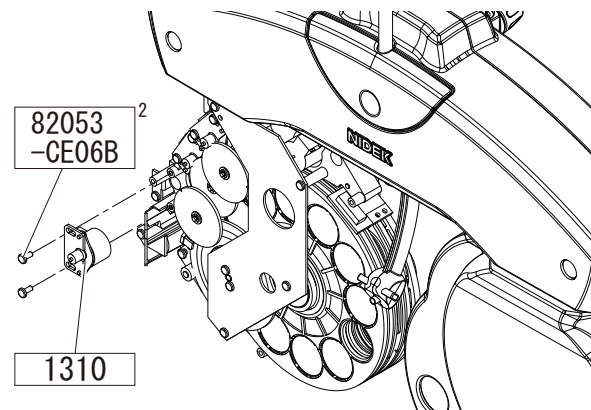
- 1 . Remove the front cover L (34090-1700) (see 6.1.8).
- 2 . Disconnect connector J3 from the MB L board (34090-BA02).
- 3 . Remove the P tight screws (82053-CE06B) (n = 2) and replace the motor SCA (34085-1310).
- 4 . Reassemble the removed parts in the reverse order.



7.1.3.2.3 Motor SCA for C2 disk

Replacement part: 34085-1310

- 1 . Remove the front cover L (34090-1700) (see 6.1.8).
- 2 . Disconnect connector J4 from the MB L board (34090-BA02).
- 3 . Remove the P tight screws (82053-CE06B) (n = 2) and replace the motor SCA (34085-1310).
- 4 . Reassemble the removed parts in the reverse order.



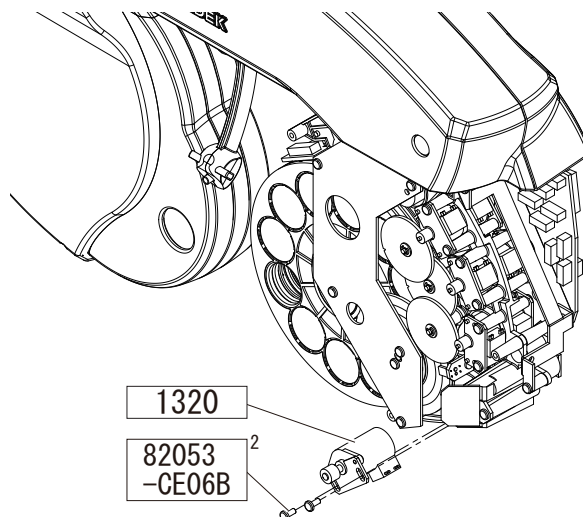
7.1.4 Motor PCA (34058-1320)

7.1.4.1 Motor PCA in frame R (34090-1300)

7.1.4.1.1 Motor PCA for CA disk

Replacement part: 34085-1320

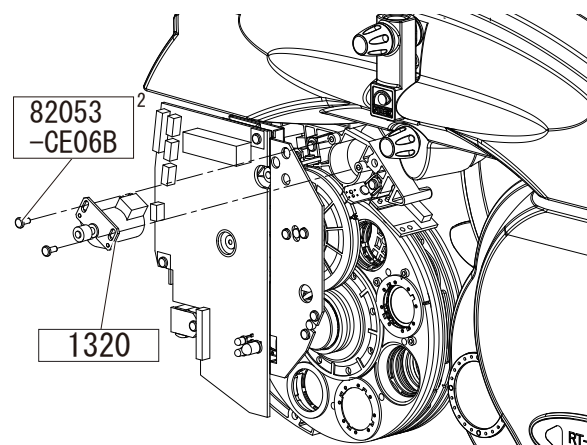
- 1 . Remove the front cover R (34090-1600) (see 6.1.6).
- 2 . Disconnect connector J8 from the MB R board (34090-BA04).
- 3 . Remove the P tight screws (82053-CE06B) (n = 2) and replace the motor PCA (34085-1320).
- 4 . Reassemble the removed parts in the reverse order.



7.1.4.1.2 Motor PCA for P2 disk

Replacement part: 34085-1320

- 1 . Remove the front cover R (34090-1600) (see 6.1.6).
- 2 . Disconnect connector J10 from the MB R board (34090-BA04).
- 3 . Remove the P tight screws (82053-CE06B) (n = 2) and replace the motor PCA (34085-1320).
- 4 . Reassemble the removed parts in the reverse order.

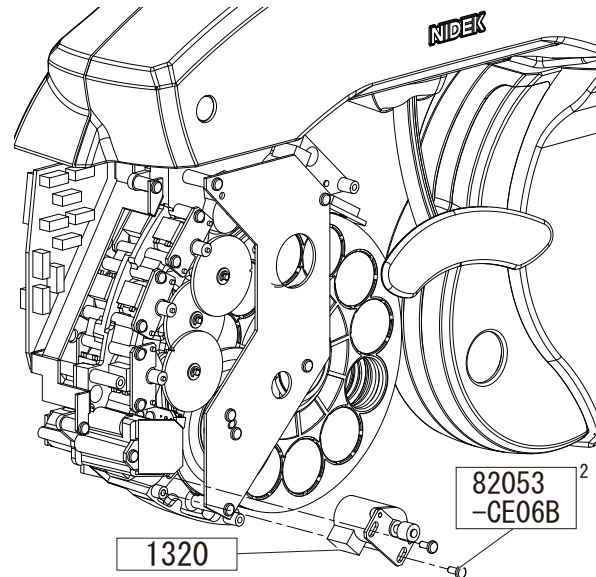


7.1.4.2 Motor PCA for frame L (34090-1400)

7.1.4.2.1 Motor PCA for CA disk

Replacement part: 34085-1320

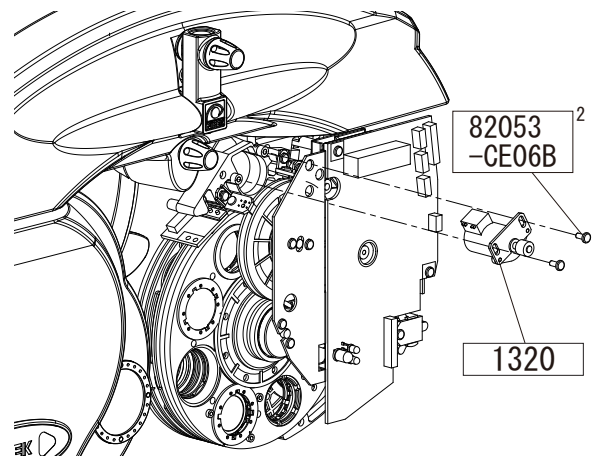
- 1 . Remove the front cover L (34090-1700) (see 6.1.8).
- 2 . Disconnect connector J8 from the MB R board (34090-BA04).
- 3 . Remove the P tight screws (82053-CE06B) (n = 2) and replace the motor PCA (34085-1320).
- 4 . Reassemble the removed parts in the reverse order.



7.1.4.2.2 Motor PCA for P2 disk

Replacement part: 34085-1320

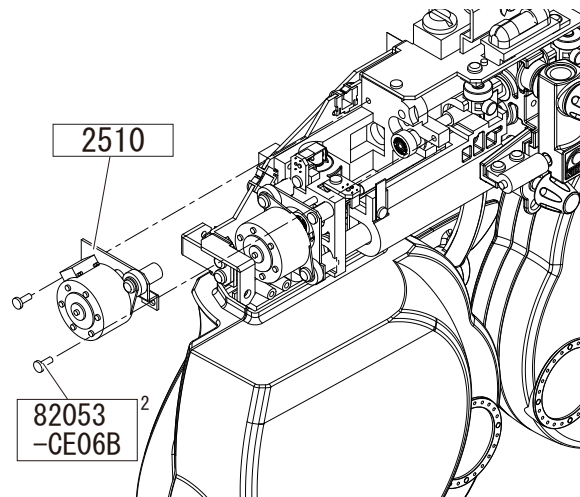
- 1 . Remove the front cover L (34090-1700) (see 6.1.8).
- 2 . Disconnect connector J10 from the MB L board (34090-BA02).
- 3 . Remove the P tight screws (82053-CE06B) (n = 2) and replace the motor PCA (34085-1320).
- 4 . Reassemble the removed parts in the reverse order.



7.1.5 PD motor R (34085-2510)

Replacement part: 34085-2510

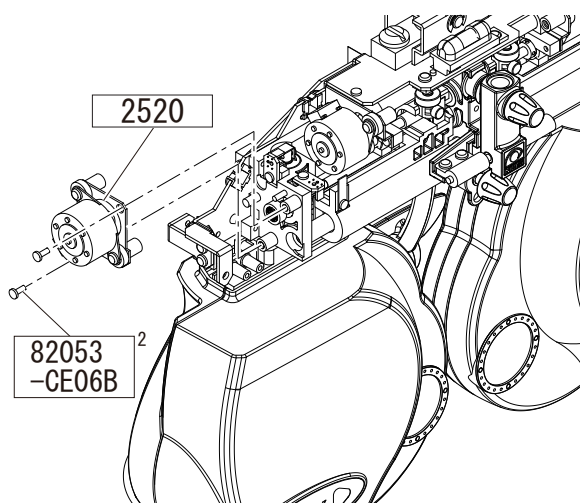
- 1 . Remove the upper cover F (34090-M257) (see 6.1.3).
- 2 . Remove the plate EMC (34085-M217) (see 7.2.1).
- 3 . Disconnect connector J6 from the MB main board (34085-BA01).
- 4 . Remove the P tight screws (82053-CE06B) (n = 2) and replace the PD motor R (34085-2510).
- 5 . Reassemble the removed parts in the reverse order.



7.1.6 COM motor R (34085-2520)

Replacement part: 34085-2520

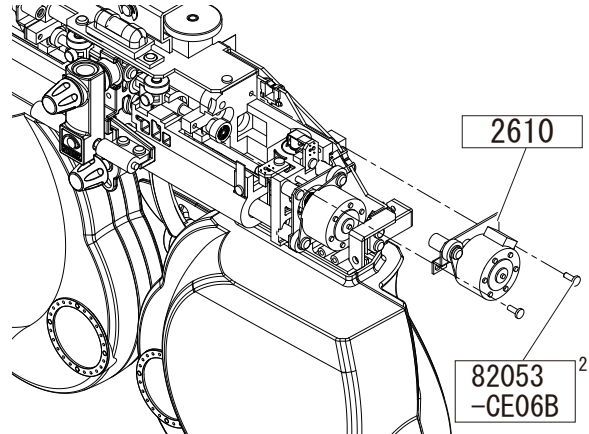
- 1 . Remove the upper cover F (34090-M257) (see 6.1.3).
- 2 . Remove the plate EMC (34085-M217) (see 7.2.1).
- 3 . Disconnect connector J7 from the MB main board (34085-BA01).
- 4 . Remove the P tight screws (82053-CE06B) (n = 2) and replace the COM motor R (34085-2520).
- 5 . Reassemble the removed parts in the reverse order.



7.1.7 PD motor L (34085-2610)

Replacement part: 34085-2610

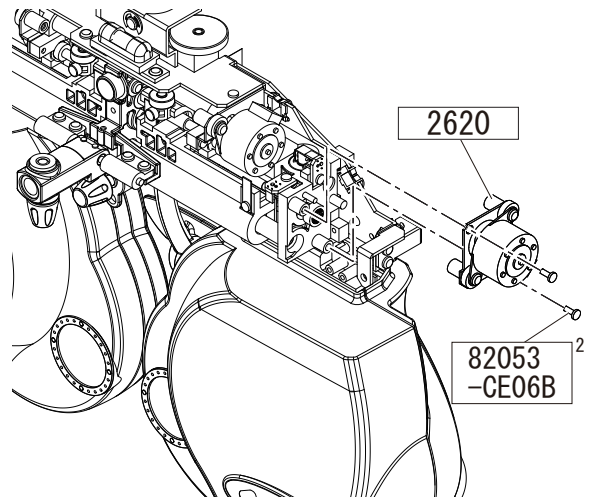
- 1 . Remove the upper cover F (34090-M257) (see 6.1.3).
- 2 . Remove the plate EMC (34085-M217). (see 7.2.1)
- 3 . Disconnect connector J5 from the MB main board (34085-BA01).
- 4 . Remove the P tight screws (82053-CE06B) (n = 2) and replace the PD motor L (34085-2610).
- 5 . Reassemble the removed parts in the reverse order.



7.1.8 COM motor L (34085-2620)

Replacement part: 34085-2620

- 1 . Remove the upper cover F (34090-M257) (see 6.1.3).
- 2 . Remove the plate EMC (34085-M217) (see 7.2.1).
- 3 . Disconnect connector J4 from the MB main board (34085-BA01).
- 4 . Remove the P tight screws (82053-CE06B) (n = 2) and replace the COM motor L (34085-2620).
- 5 . Reassemble the removed parts in the reverse order.

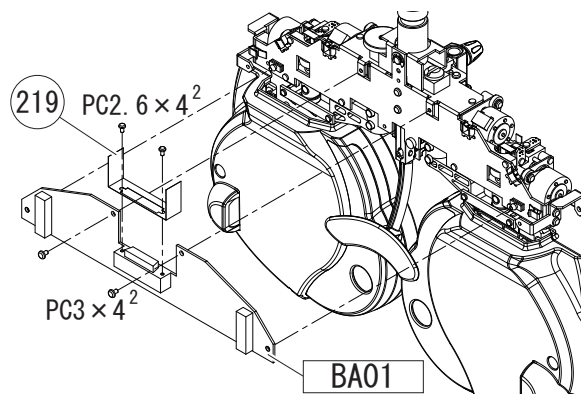


7.2 Boards

7.2.1 MB main board (34085-BA01)

Replacement part: 34085-BA01

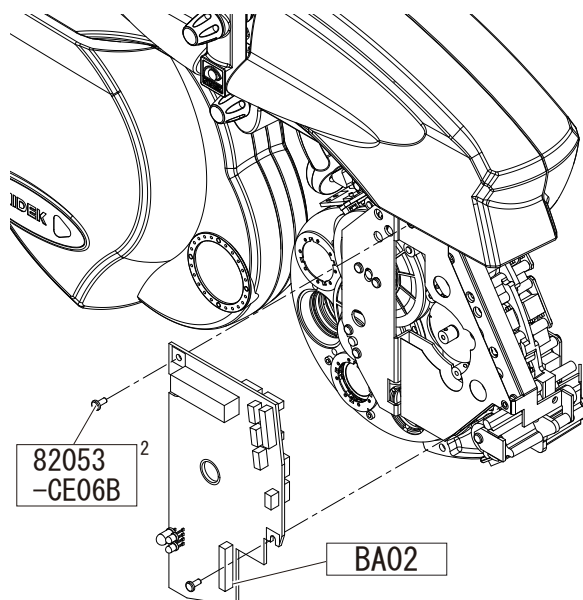
- 1 . Remove the upper cover F (34090-M257) (see 6.1.3).
- 2 . Unscrew PC2.6 x 4 (n = 2) and remove the cover connector (34085-M219).
- 3 . Disconnect all connectors from the MB main board (34085-BA01).
- 4 . Unscrew PC3 x 4 (n = 2) and replace the MB main board (34085-BA01).
- 5 . Reassemble the removed parts in the reverse order.



7.2.2 MB L board (34090-BA02)

Replacement part: 34090-BA02

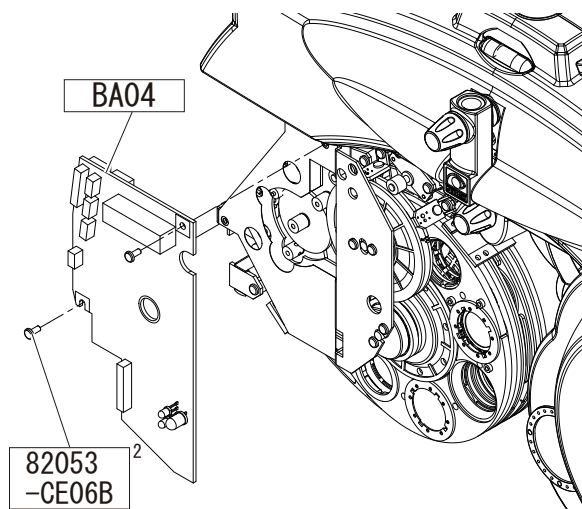
- 1 . Remove the front cover L (34090-1700) (see 6.1.8).
- 2 . Disconnect all connectors from the MB L board (34090-BA02).
- 3 . Remove the P tight screws (82053-CE06B) (n = 2) and replace the MB L board (34090-BA02).
- 4 . Reassemble the removed parts in the reverse order.



7.2.3 MB R board (34090-BA04)

Replacement part: 34090-BA04

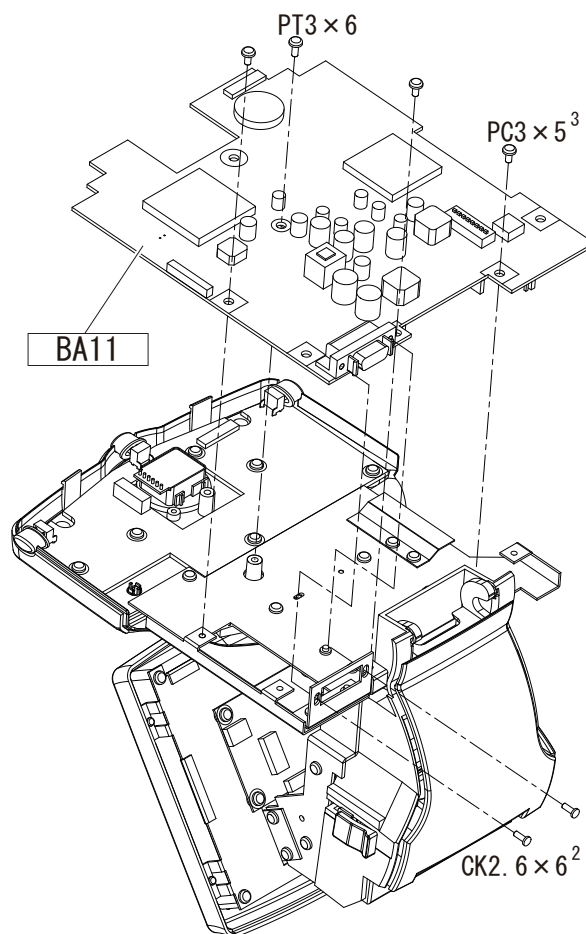
- 1 . Remove the front cover R (34090-1600) (see 6.1.6).
- 2 . Disconnect all connectors from the MB R board (34090-BA04).
- 3 . Remove the P tight screws (82053-CE06B) (n = 2) and replace the MB R board (34090-BA04).
- 4 . Reassemble the removed parts in the reverse order.



7.2.4 CB main board (34090-BA11)

Replacement part: 34090-BA11

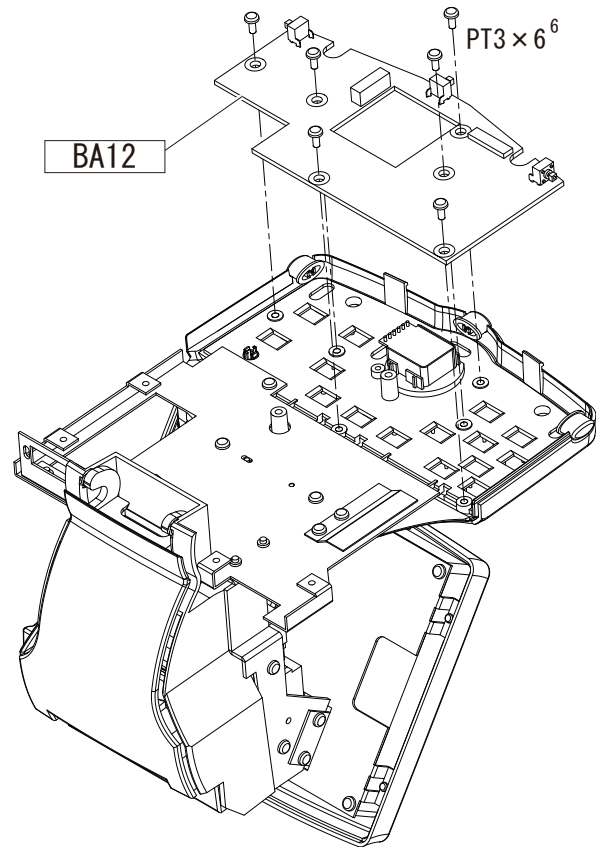
- 1 . Remove the control box cover (see 6.2).
- 2 . Disconnect all connectors from the CB main board (34090-BA11).
- 3 . Unscrew PC3 x 5 (n = 3) and PT3 x 6, and then, replace the BC main board (34090-BA11).
- 4 . Reassemble the removed parts in the reverse order.
- 5 . Set the initial pulse (see 8.2).



7.2.5 Key I/F board (34090-BA12)

Replacement part: 34090-BA12

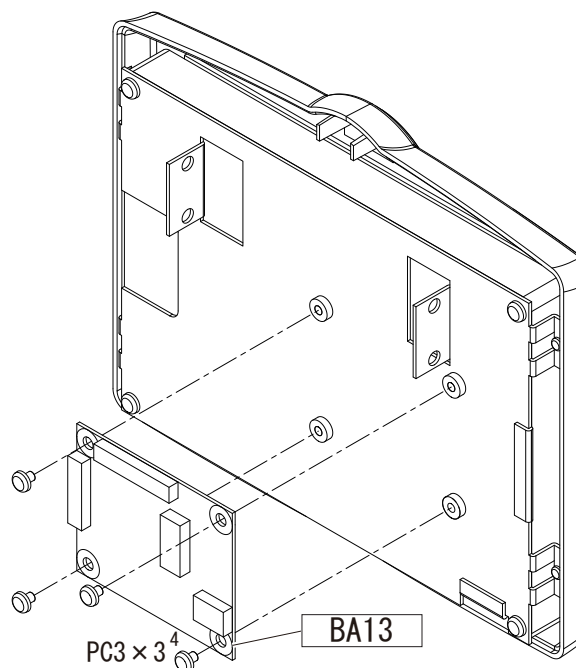
- 1 . Remove the BC main board (34090-BA11).
- 2 . Disconnect all connectors from the key I/F board (34090-BA12).
- 3 . Unscrew PT3 x 6 (n = 6) and replace the key I/F board (34090-BA12).
- 4 . Reassemble the removed parts in the reverse order.



7.2.6 LCD I/F board (34090-BA13)

Replacement part: 34090-BA13

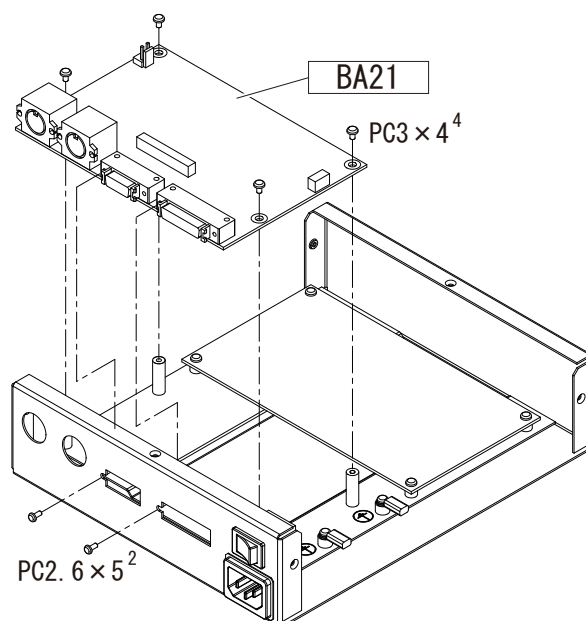
- 1 . Remove the LCD ASSY (34090-4200) (see 7.1.1).
- 2 . Disconnect all connectors from the LCD I/F board (34090-BA13).
- 3 . Unscrew PC3 x 3 (n = 4) and replace the LCD I/F board (34090-BA13).
- 4 . Reassemble the removed parts in the reverse order.



7.2.7 RB main board (34090-BA21)

Replacement part: 34090-BA21

- 1 . Disconnect all cables connected to the relay box.
- 2 . Remove the relay box from the system table.
- 3 . Disconnect connector P1 (J1) from the RB main board (34090-BA21).
- 4 . Unscrew PC2.6 x 5 (n = 2) and PC3 x 4 (n = 4), and then, replace the RB main board (34090-BA21).
- 5 . Reassemble the removed parts in the reverse order.

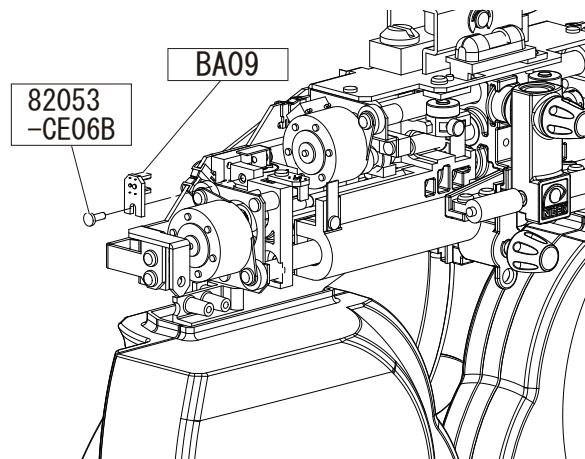


7.2.8 PI sensor board (34085-BA09)

7.2.8.1 PI sensor board on upper base R ASSY (34085-2500)

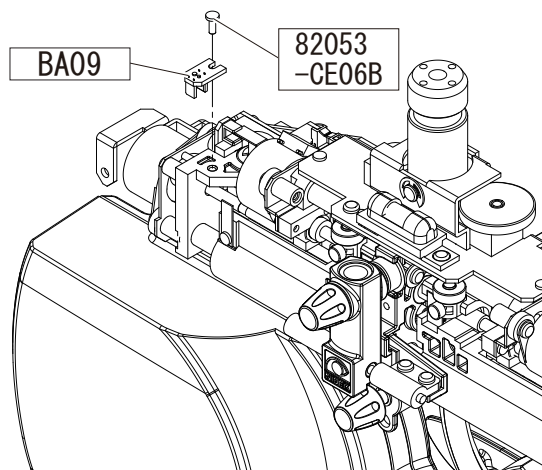
7.2.8.1.1 PI sensor board for CON

- 1 . Remove the upper cover F (34090-M257) (see 6.1.3).
- 2 . Remove the plate EMC (34085-M217) (see 7.2.1).
- 3 . Disconnect connector J11 from the MB main board (34085-BA01).
- 4 . Remove the P tight screw (82053-CE06B) and replace the PI sensor board (34085-BA09).
- 5 . Reassemble the removed parts in the reverse order.



7.2.8.1.2 PI sensor board for PD

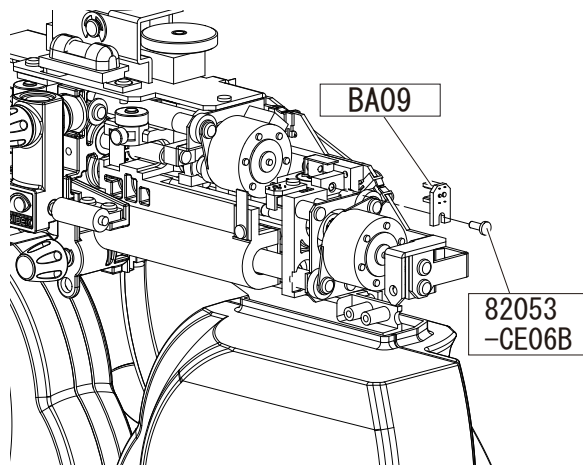
- 1 . Remove the upper cover F (34090-M257) (see 6.1.3).
- 2 . Remove the plate EMC (34085-M217) (see 7.2.1).
- 3 . Disconnect connector J10 from the MB main board (34085-BA01).
- 4 . Remove the P tight screw (82053-CE06B) and replace the PI sensor board (34085-BA09).
- 5 . Reassemble the removed parts in the reverse order.



7.2.8.2 PI sensor board on upper base L (34085-2600)

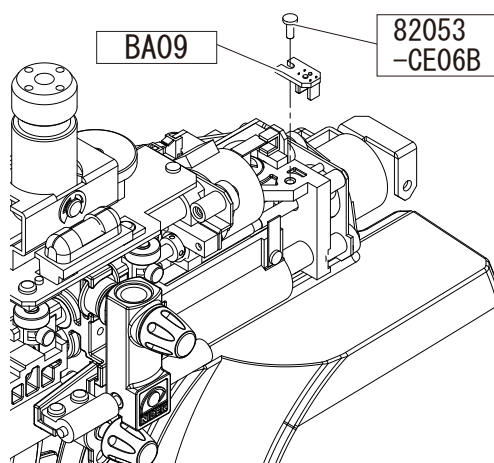
7.2.8.2.1 PI sensor board for CON

- 1 . Remove the upper cover F (34090-M257) (see 6.1.3).
- 2 . Remove the plate EMC (34085-M217) (see 7.2.1).
- 3 . Disconnect connector J9 from the MB main board (34085-BA01).
- 4 . Remove the P tight screw (82053-CE06B) and replace the PI sensor board (34085-BA09) for CON.
- 5 . Reassemble the removed parts in the reverse order.



7.2.8.2.2 PI sensor board for PD

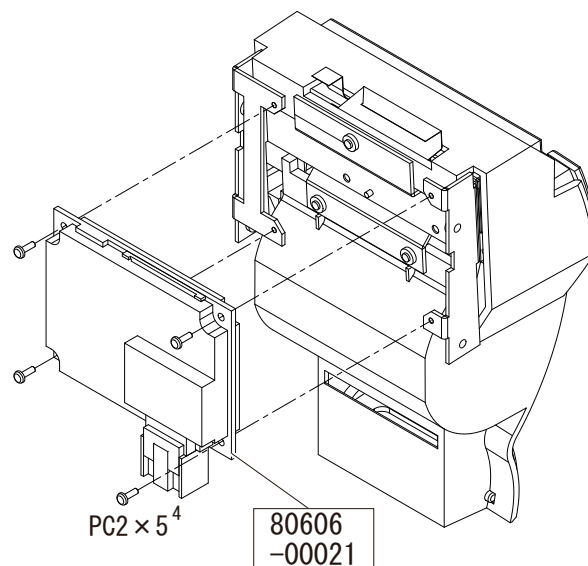
- 1 . Remove the upper cover F (34090-M257) (see 6.1.3).
- 2 . Remove the plate EMC (34085-M217) (see 7.2.1).
- 3 . Disconnect connector J8 from the MB main board (34085-BA01).
- 4 . Remove the P tight screw (82053-CE06B) and replace the PI sensor board (34085-BA09) for PD.
- 5 . Reassemble the removed parts in the reverse order.



7.2.9 Printer interface board (80606-00021)

Replacement part: 80606-00021

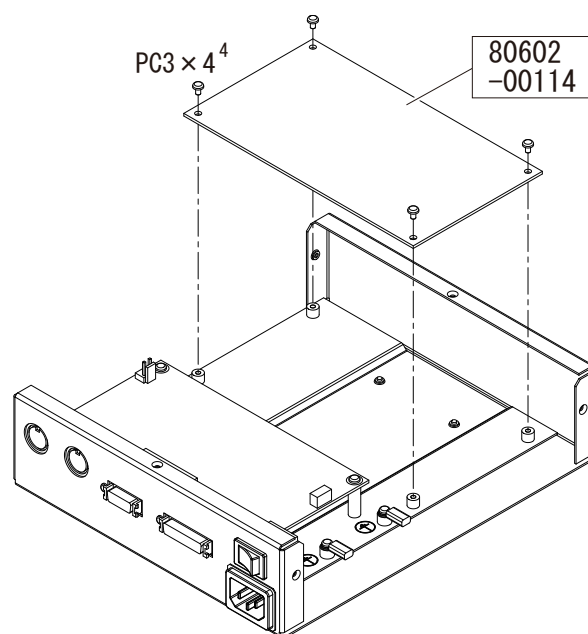
- 1 . Remove the printer ASSY (34090-4400) (see 7.1.2).
- 2 . Disconnect all connectors from the printer interface board (80606-00021).
- 3 . Unscrew PC2 x 5 (n = 4) and replace the printer interface board (80606-00021).
- 4 . Reassemble the removed parts in the reverse order.



7.2.10 Switching power supply (80602-00114)

Replacement part: 80602-00114

- 1 . Disconnect all connectors connected to the relay box.
- 2 . Remove the relay box from the system table.
- 3 . Disconnect all connectors from the switching power supply (80602-00114).
- 4 . Unscrew PC3 x 4 (n = 4) and replace the switching power supply (80602-00114).
- 5 . Reassemble the removed parts in the reverse order.

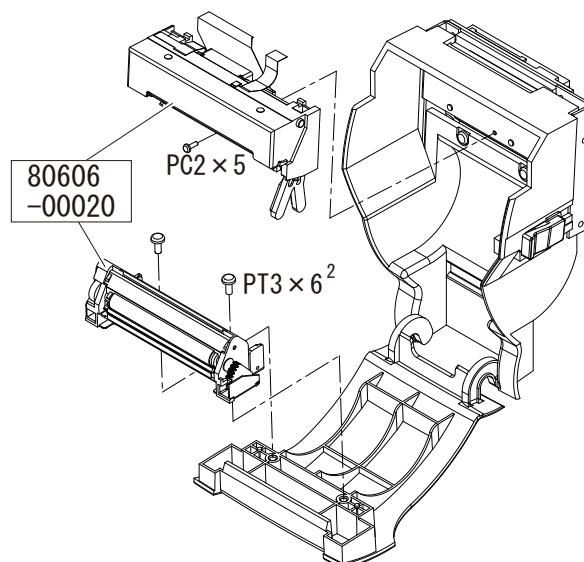


7.3 Electrical Parts

7.3.1 Printer (80606-00020)

Replacement part: 80606-00020

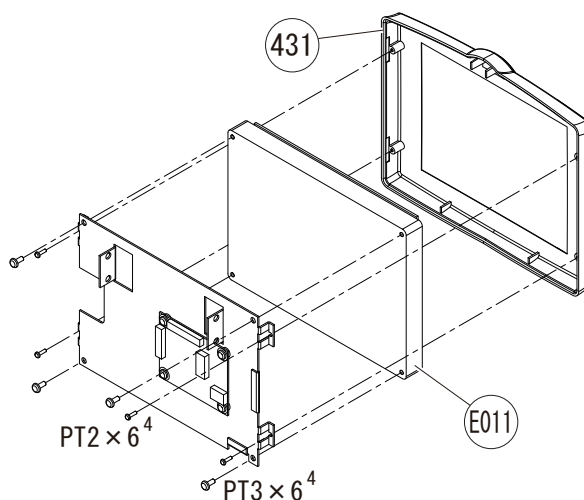
- 1 . Remove the printer ASSY (34090-4400) (see 7.1.2).
- 2 . Remove the cable on the printer (80606-00020) from the printer interface board (80606-00021).
- 3 . Unscrew PT3 x 6 (n = 2) and PC2 x 5, and then replace the printer (80606-00020).
- 4 . Reassemble the removed parts in the reverse order.



7.3.2 5.7-inch LCD with touch panel (34090-E011)

Replacement part: 34090-E011

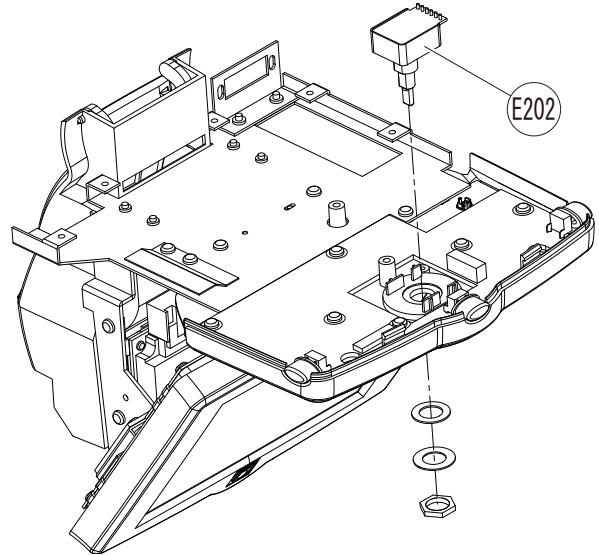
- 1 . Remove the LCD ASSY (34090-4200) (see 7.1.1).
- 2 . Disconnect connectors J2, J3, and J4 from the LCD I/F board (34090-BA13).
- 3 . Unscrew PT2 x 6 (n = 4) and replace the LCD cover (34090-M431).
- 4 . Unscrew PT3 x 6 (n = 4) and replace the 5.7-inch LCD with touch panel (34090-E011).
- 5 . Reassemble the removed parts in the reverse order.
- 6 . Adjust the touch panel (see 8.10).



7.3.3 Rotary encoder (34085-E202)

Replacement part: 34085-E202

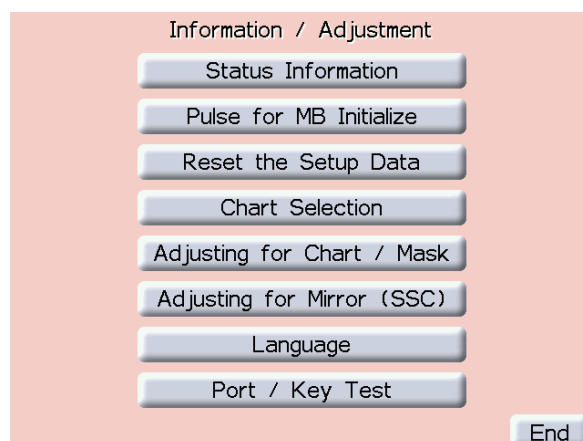
- 1 . Remove the EMC cover (34090-M418) (see 7.2.4).
- 2 . Disconnect connector J21 from the key I/F board (34090-BA12).
- 3 . Remove the provided nut from the rotary encoder (34085-E202). Then, replace the rotary encoder (34085-E202).
- 4 . Reassemble the removed parts in the reverse order.



8 ADJUSTMENT

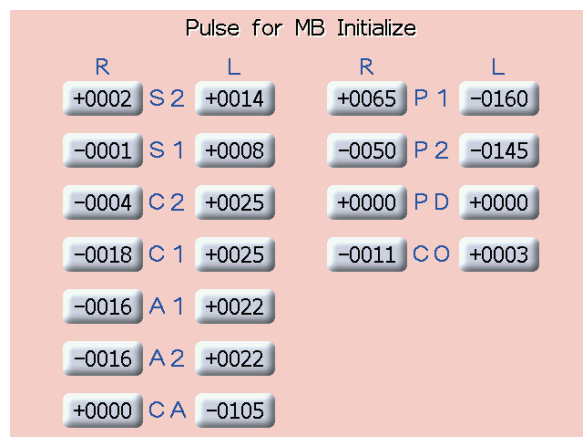
8.1 Displaying Information/Adjustment Screen

- 1 . Press Shift + the right side key on the control box to display the Information / Adjustment screen.
- 2 . Press the button of the desired item to perform the adjustment and printout of the information.



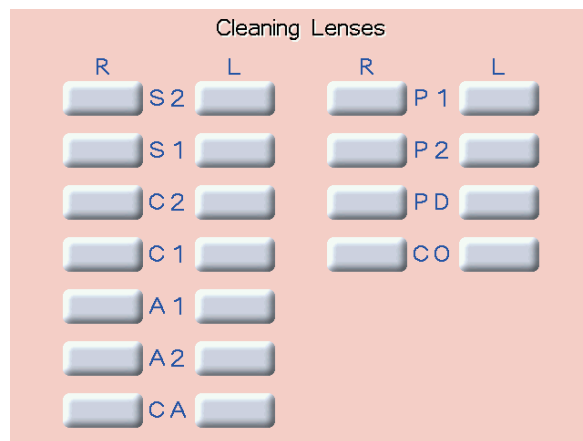
8.2 MB Initial Pulse Setting

- 1 . Set DIP switch 1 on the MB main board (34085-BA01) to the ON position to turn on the power.
 - * Or, set DIP switch 1 on the MB main board (34085-BA01) to the ON position and press Shift + Print on the control box to clear.
- 2 . Select a disk to be changed.
 - * The types of the disk are listed in the order as viewed from the patient toward the refractor head.
- 3 . Turn the dial of the control box to change the initial pulse value for refractor head.
- 4 . After changed, press Shift + Print on the control box.
 - * Pressing Shift and Print saves the initial pulse value.



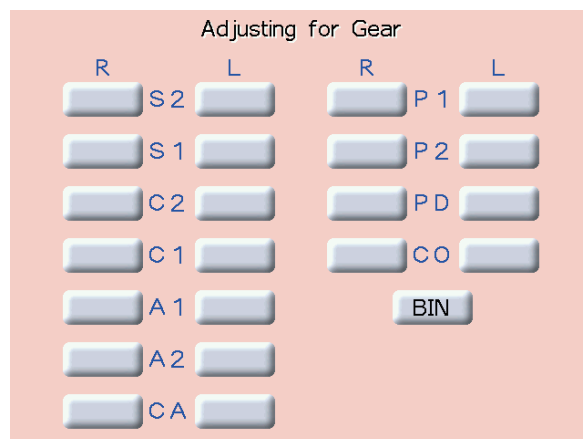
8.3 Lens Cleaning Mode

- 1 . Remove the refractor head covers (see 6.1).
- 2 . Set DIP switch 2 on the MB main board (34085-BA01) to the ON position to turn on the power.
 - * Or, set DIP switch 2 on the MB main board (34085-BA01) to the ON position and press Shift + Print on the control box to clear.
- 3 . Select a disk to be cleaned.
 - * The types of the disk are listed in the order as viewed from the patient toward the refractor head.
- 4 . Turn the dial on the control box to turn the specified disk.
- 5 . Clean the lens.



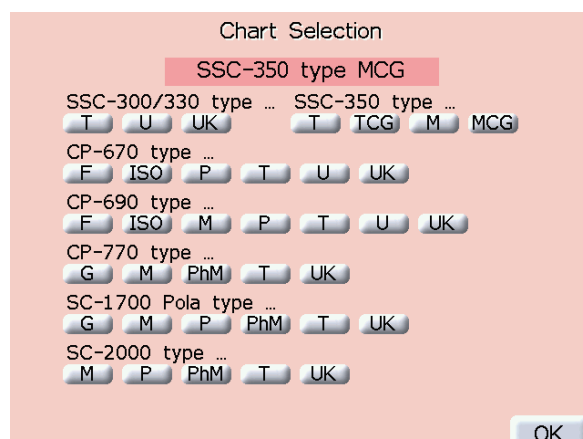
8.4 Gear adjustment mode

- 1 . Set DIP switch 3 on the MB main board (34085-BA01) to the ON position to turn on the power.
 - * Or, set DIP switch 3 on the MB main board (34085-BA01) to the ON position and press Shift + Print on the control box to clear.
- 2 . Select the disk of which gear is to be adjusted.
 - * The types of the disk are listed in the order as viewed from the patient toward the refractor head.
- 3 . Turn the dial on the control box to adjust the gear.
 - 1) Binocular mode: when pressing either R or L, the same disks for both R and L will be specified.
 - * The [BIN] button is highlighted.
 - 2) Monocular mode: when pressing either R or L, only the selected disk will be specified.
 - * The [BIN] button is not highlighted.



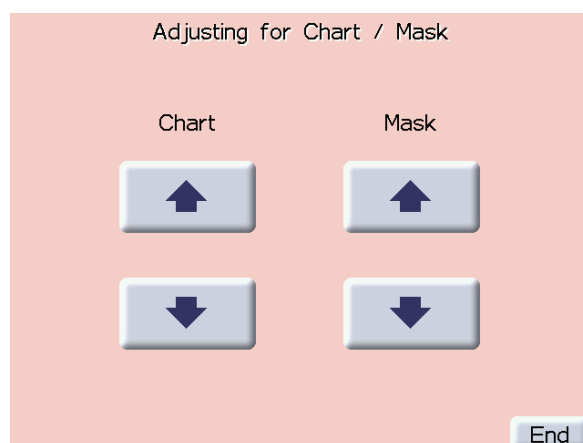
8.5 Chart Selection

- 1 . Display the Information / Adjustment screen (see 8.1).
- 2 . Press [Chart Selection] to display the Chart Selection screen.
 - * The chart type that is selected at present is displayed on the screen.
- 3 . Press a desired chart type. The chart type changes to the selected one.
- 4 . Press [OK] or turn off and on the power to change the setting to the specified chart type.



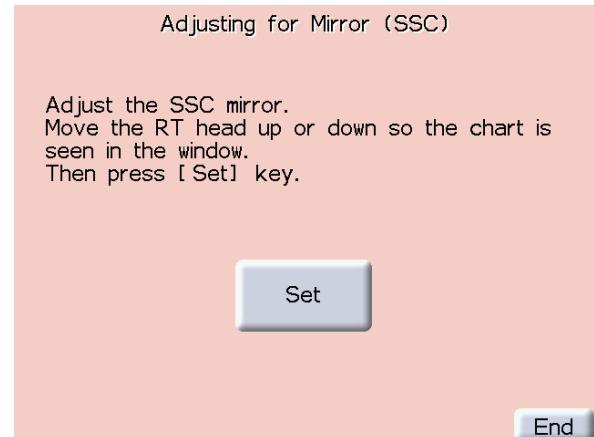
8.6 Chart Adjustment

- 1 . Display the Information / Adjustment screen (see 8.1).
- 2 . Press [Adjusting for Chart / Mask].
- 3 . Adjust the chart position.
 - 1) Pressing the up-arrow button on the Chart side: The chart moves upward.
 - 2) Pressing the down-arrow button on the Chart side: The chart moves downward.
- 4 . Adjust the mask position.
 - 1) Pressing the up-arrow button on the Mask side: The mask moves upward.
 - 2) Pressing the down-arrow button on the Mask side: The mask moves downward.
- 5 . Pressing [End] returns to the Adjusting for Chart / Mask screen.
 - * When the CP-770 is connected, the chart switching key and the key for switching fine and coarse adjustments are also displayed on the screen.
For the adjustment procedure, refer to the CP-770 Service Manual.



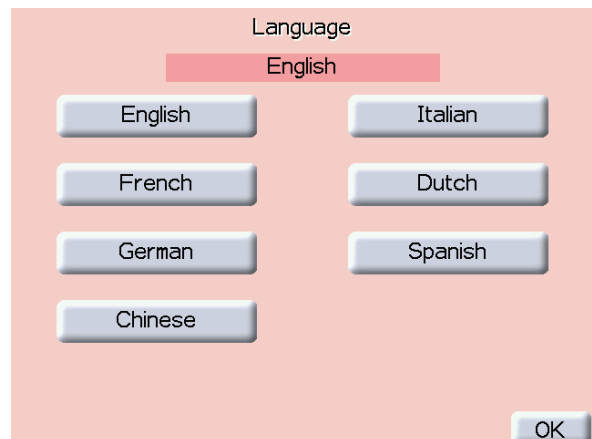
8.7 Mirror Adjustment

- 1 . Display the Information / Adjustment screen (see 8.1).
- 2 . Press [Adjusting for Mirror (SSC)] to display the Adjusting for Mirror (SSC) screen.
 - * When the chart other than the SSC is selected, the screen cannot be displayed.
- 3 . Move the RT head to the upper limit so that the chart can be seen in the middle, and press [Set].
- 4 . Pressing [End] returns to the Adjusting for Chart / Mask screen.



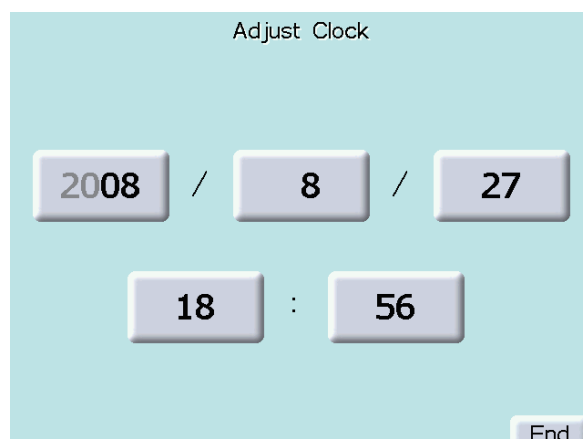
8.8 Language

- 1 . Display the Information / Adjustment screen (see 8.1).
- 2 . Press [Language] to display the Language screen.
- 3 . Select a desired language and press [OK].
Turning off and on the power also turns the language to be the selected one.

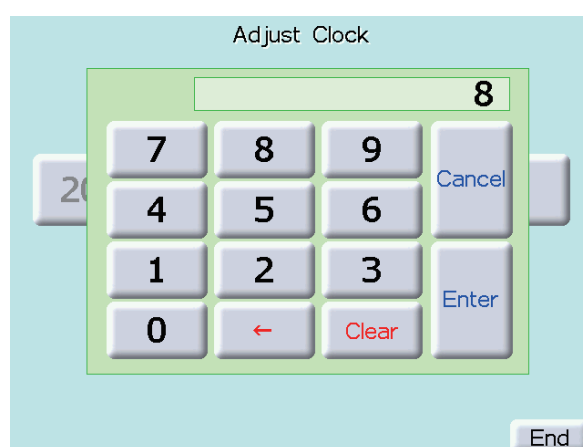


8.9 Clock Setting

- 1 . Press [Adjust Clock] on the Menu screen.
- 2 . Select an item to be changed.

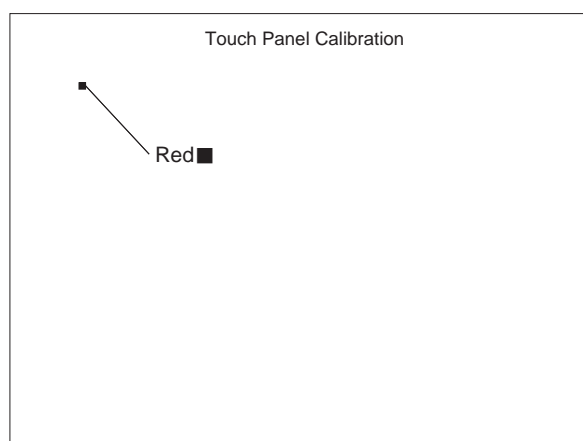


- 3 . Set the clock using the touch-screen panel. Then, press [Enter].
- 4 . Press [End] to save the clock setting and return to the normal measurement screen.



8.10 Touch-Screen Panel Calibration

- 1 . Press the Shift and Dial key to display the Touch Panel Calibration screen.
- 2 . Press the red square at the upper-left corner of the screen with the touch-screen pen.
 - * Pressing here changes the color of the square to blue.
- 3 . Press the red square at the upper-right corner of the screen with the touch-screen pen
- 4 . Press the red square at the lower-left corner of the screen with the touch-screen pen.
- 5 . Press the red square at the lower-right corner of the screen with the touch-screen pen.
 - * When all four squares, one at each corner of the screen, are pressed, the message "Completed the Touch Panel Calibration" appears and the screen returns to the normal measurement screen.



8.11 Parameter Settings

- 1 . Press [Parameters] on the Main Menu screen.
- 2 . The Parameters screen appears.
- 3 . Select the desired item to be changed.
- 4 . Follow the procedures below to change the page of the Parameters screen.

- 1) Pressing [Back] displays the previous page.
- 2) Pressing [Next] displays the next page.
- 3) Pressing [Next] on the last page of the screen displays the first page of the screen.
- 4) Pressing [Back] on the first page of the screen displays the last page of the screen.

Parameters		Page : 1
CYL mode	—	
AXIS step	5	
SPH step (Shift)	1.00 D	
XC mode S.E fix	Yes	
CYL mode S.E fix	No	
Prism display format	X/Y	
Input prism from LM	No	
SPH Far→Near	SPH + ADD	
▲Back ▼Next		Import Export End

8.12 Printing Adjustment Value

- 1 . Printing the Status Information.
 - 1) Display the Information / Adjustment screen (see 8.1).
 - 2) Press [Status Information] to print the status information.
- 2 . Printing the initial pulse for MB
 - 1) Display the Information / Adjustment screen (see 8.1).
 - 2) Press [Pulse for MB Initialize] to print the initial pulse for MB.

8.13 Resetting Setup Data

- 1 . Display the Information / Adjustment screen (see 8.1).
- 2 . Press [Reset the Setup Data].
- 3 . The Reset the Setup Data window appears.
- 4 . Pressing [Yes] returns the value to the setup data.
- 5 . Select the chart used at present again (see 8.5).

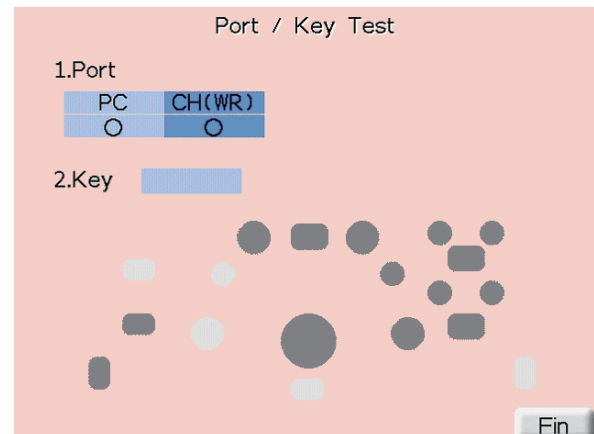
8.14 Checking Keys

1 . Display the Information / Adjustment screen (see 8.1).

2 . Press [Port / Key Test].

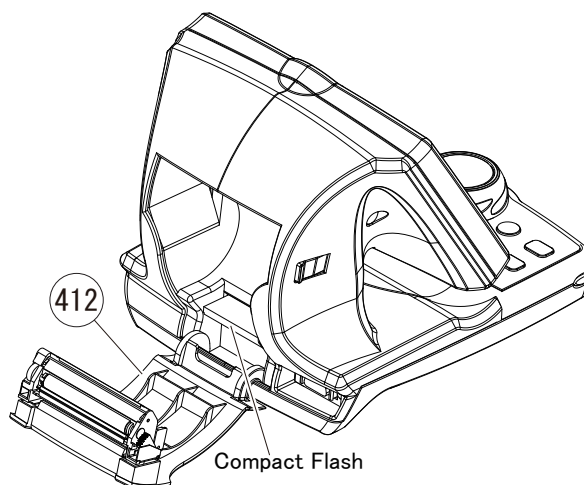
3 . Press each of the control panel key, left and right side keys, front key, and dial key twice. The key position displayed on the screen turns from white into gray, which means the key functions.

* The port usually cannot be checked on the field.



8.15 Upgrading Software

- 1 . Write the upgrading program files into a Compact Flash card on a PC.
- 2 . Open the CF cover (34085-M412) while the power of the RT-3100 CB is off.
- 3 . Remove the printer paper.
- 4 . When the Compact Flash card is inserted in the slot, eject it.
- 5 . Insert the other Compact Flash card in which the program is written into the slot.
- 6 . Turn on the power while pressing the Shift key of the control box.



- 7 . A list of the upgrading program files appears on the display of the control box, and the files saved in the Compact Flash card in Motorola S format (*.mot) are displayed in a list.

* The asterisks (*****) in the file names of RT11CB_*****.mot,

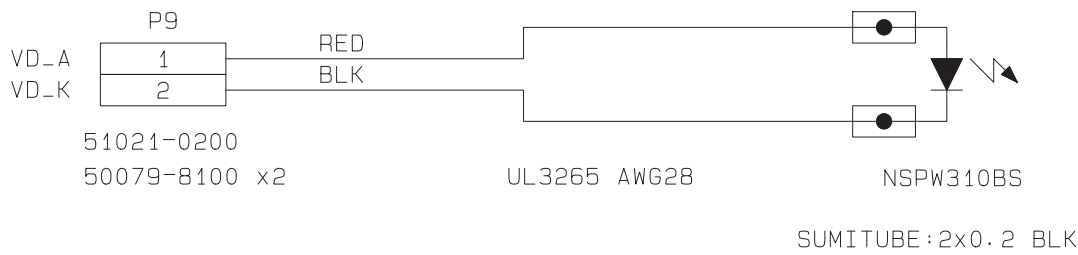
RT11MB_*****.mot, or RT10MB_*****.mot indicate their versions.

Devices	File names
Control box	RT11CB_*****.mot
Refractor head	RT10MB_*****.mot or RT11MB_*****.mot

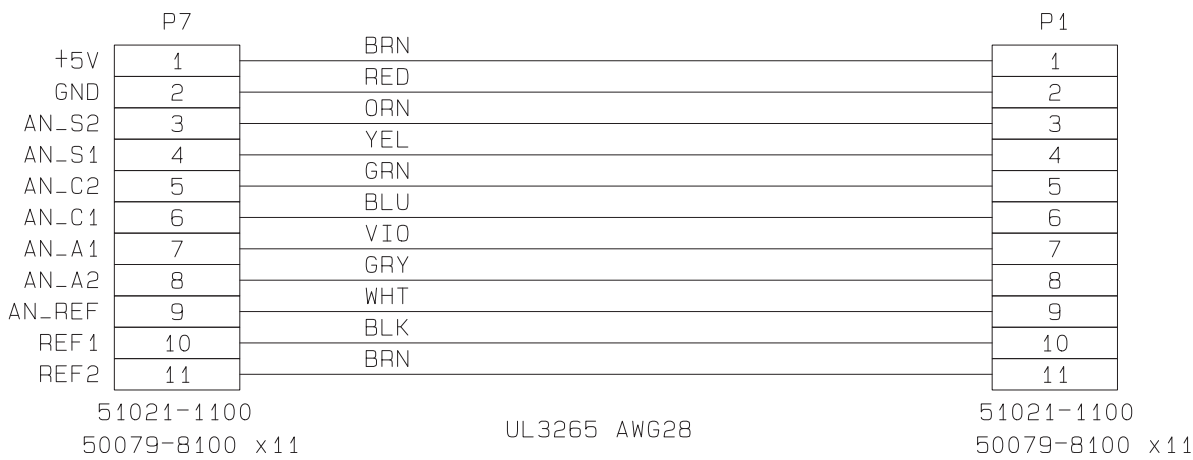
- 8 . Select the file name to be upgraded with the up-arrow/down-arrow button on the screen and press [SELECT].
- 9 . Press [OK] in the confirmation dialog box to start upgrading.
 - * In order to cancel the upgrade, press [NO].
 - * Never turn off the power while upgrading.
10. The display returns to the file list screen after the upgrading is completed.
 - * Perform the upgrading of each device (refractor head/control box) as necessary.
 - * The data will be reset after upgrading Control Box, therefore, when continuing to upgrade the other device, start the procedure from Step 6 again.
11. Turn off the power after the upgrading is completed.
12. Eject the Compact Flash card in which the upgrading program is written.
13. When the original Compact Flash card exists, insert the original Compact Flash card, and turn down the ejection lever to close the CF cover (34090-M412).
14. Insert the original Compact Flash card, and turn down the ejection lever to close the CF cover (34085-M412).
 - * Software versions can be confirmed by printing out the status information.

9.2 Connector cables

34085-EA02

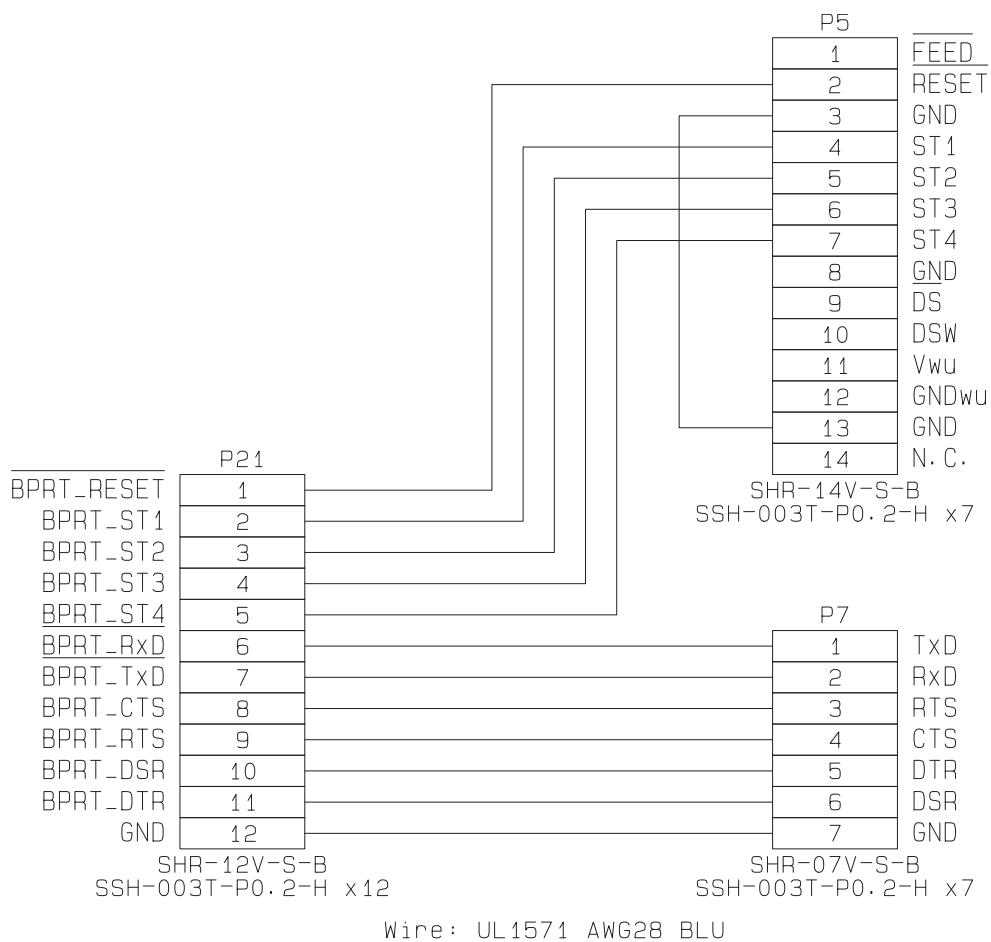


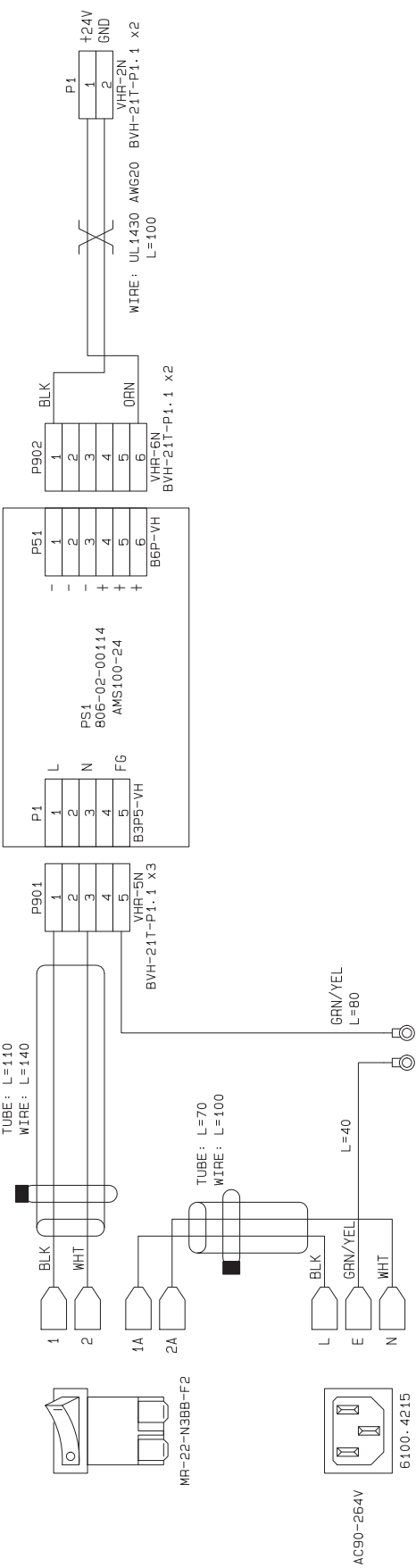
34085-EA04



34090-EA11



34090-EA12



9.3 Error Messages

Message	Contents
Error01: Communication Error CB-MB.	Data communication error between the CB and MB The MB does not work. Failure in the communication cable between the CB and MB
No data!!	The data to be input in IC card or such does not exist.
Chart doesn't work.	Changing chart is attempted while another chart is still loading. The displayed chart type is not the selected one. The chart is not connected. Failure in the connecting cable Failure in the communication cable between the CB and RB
No print paper.	No printer paper is set.
Printer cover is open.	The printer cover is open.
Printer Error.	The printer does not function properly.
Setup data is initialized.	The data saved by the battery in the CB was deleted or changed from some cause (such as failure in battery or other). The setup data was reset by pressing Shift + the right side key while in the Menu screen.
CF card -- Read Error!!	No data exists in the Compact Flash card. Failure in the connector of the Compact Flash card reader
CF card -- Write Error!!	Insufficient space in the Compact Flash card Failure in the connector of the Compact Flash card reader
CF card -- Card not found!!	The Compact Flash card is not inserted.
Error:XX Y	The motor sensor is not detectable in the MB. * "XX" of Error: XX Y indicates its sensor name. "Y" of Error: XX Y indicates the right or left. * Sensor name: S1/S2/C1/C2/CA/A1/A2/P1/P2/PD/CON * Y: R (right) or L (left)
Error:Y DRIVER BOARD	Communication between the MB main board and MB R board/MB L board is not performed properly. * "Y" of "Error:Y DRIVER BOARD" indicates R (MB R board) or L (MB L board).
Error:Y DRIVER VERSION	The version of the MB R board/MB L board is not compatible to that of the MB main board. * "Y" of "Error:Y DRIVER VERSION" indicates R (MB R board) or L (MB L board).

* Explanation of abbreviations

1) MB: Refractor head

2) CB: Control box

3) RB: Relay box

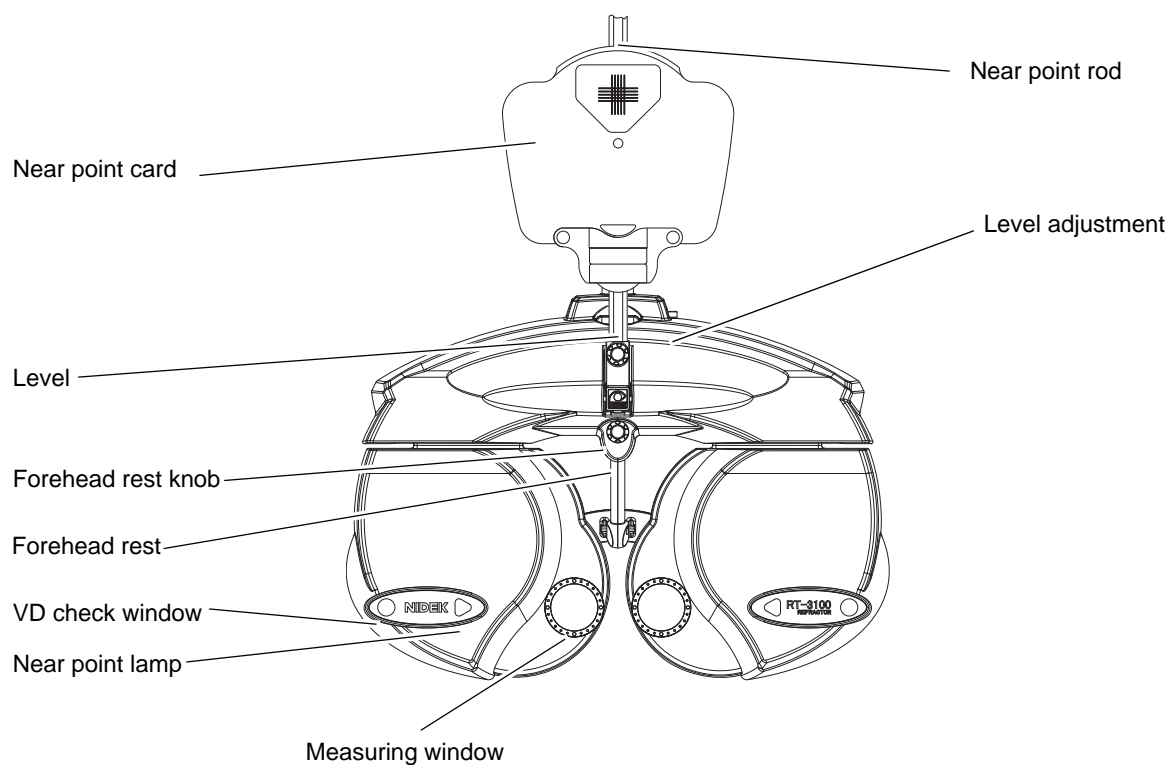
9.4 Parameter List

Page	Items	Default	Set contents
1	CYL mode	-	- / +
	AXIS step	5	1 / 5
	SPH step (Shift)	1.00D	0.50 to 3.00D
	XC mode S.E fix	Yes	Yes / No
	CYL mode S.E fix	No	Yes / No
	Prism display format	X/Y	r θ
	Input prism from LM	No	Yes / No
	SPH Far → Near	SPH+ADD	SPH / SPH+ADD
2	Working distance (WD)	40 cm	35cm to 70cm
	Print CL data	No	Yes / No
	Print TL data	No	Yes / No
	Clear after print	Yes	Yes / No
	Printer	On	On / Off
	Date format for print	mm/dd/yyyy	mm/dd/yyyy dd/mm/yyyy yyyy/mm/dd
	Program A	Fix	Fix / User
	Adjust ADD Subj _ Final	Yes	Yes / No
3	Preset power of Subj	AR	AR / LM
	Lens for Retino	+1.50D	+1.50D / +2.00D
	Auto lamp off	15 min	Off / 5min / 15min / 30min
	Near lamp link	Yes	Yes / No
	Beep sound	High	High / Low / Off
	Brightness	3	3 to 1
	Chart link	Yes	Yes / No (Other than SC series) Cable / Wireless1 to 8 / No (SC series)
	System No.	Off	Off / 1 - 10

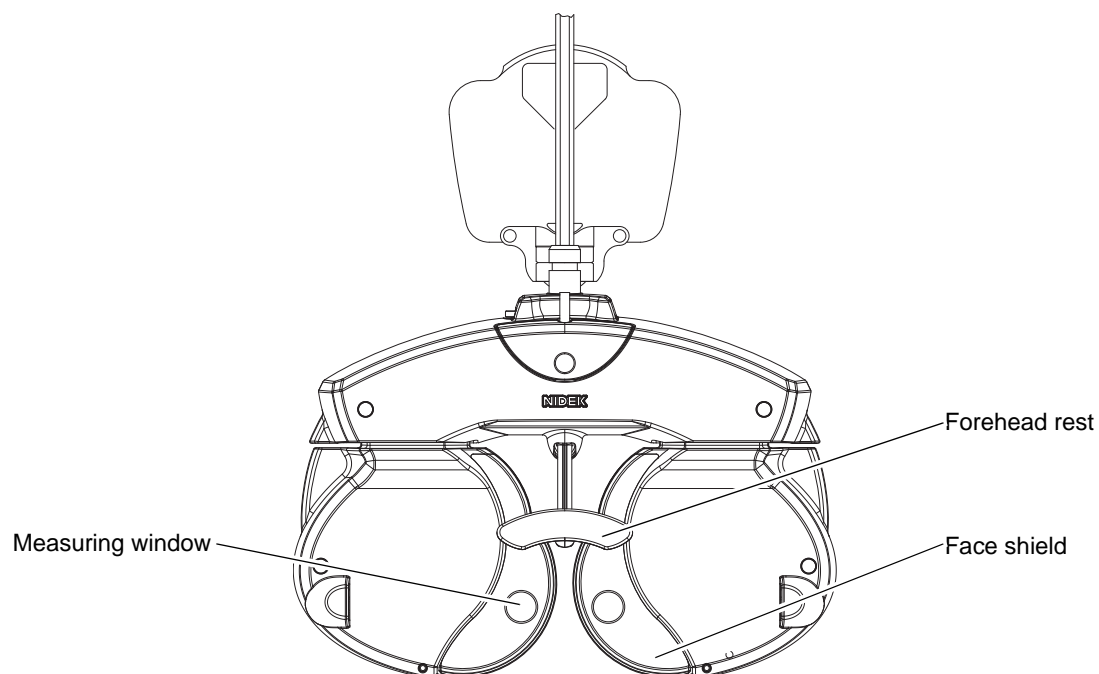
9.5 External View

9.5.1 Refractor head

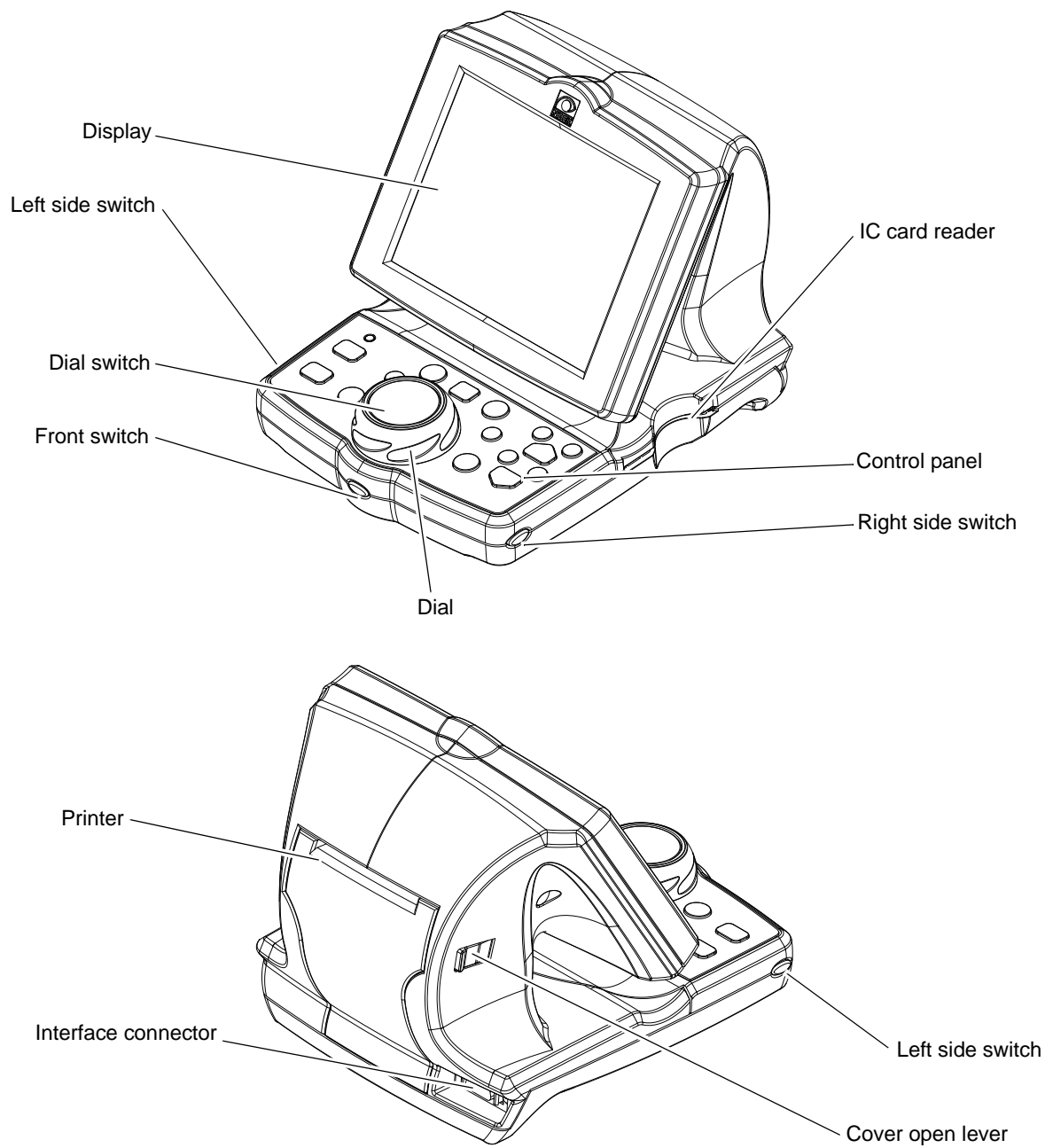
Operator's side



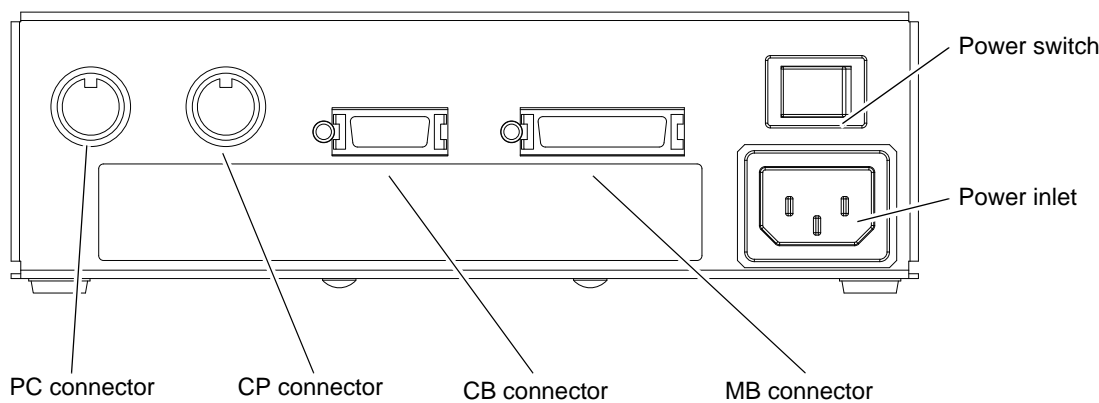
Patient's side



9.5.2 Control box

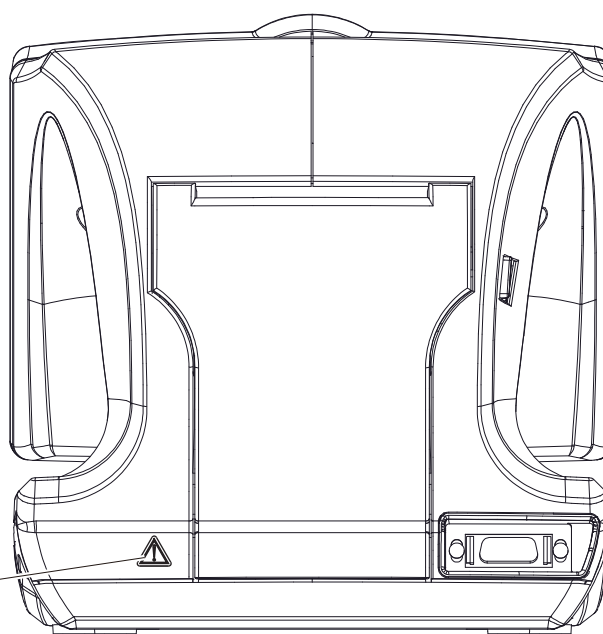
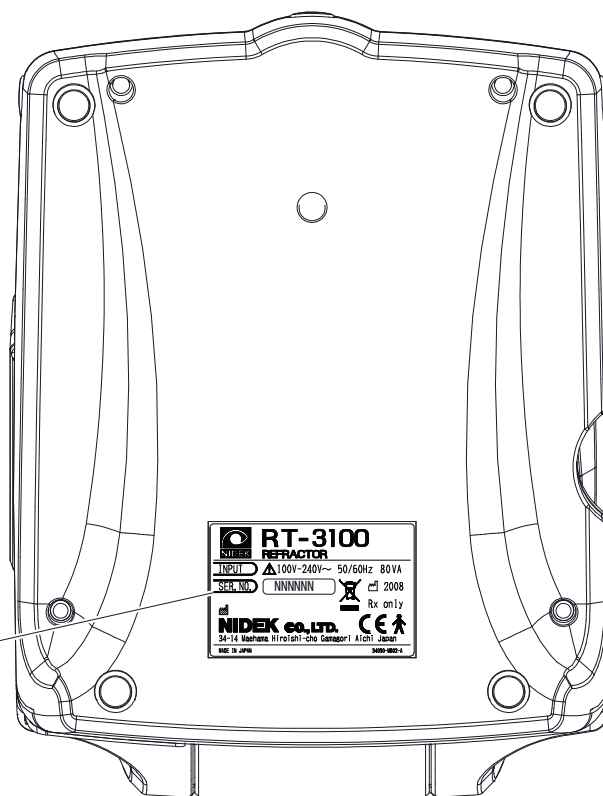
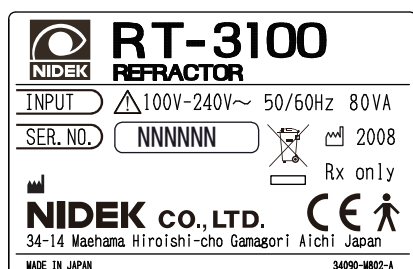


9.5.3 Relay box

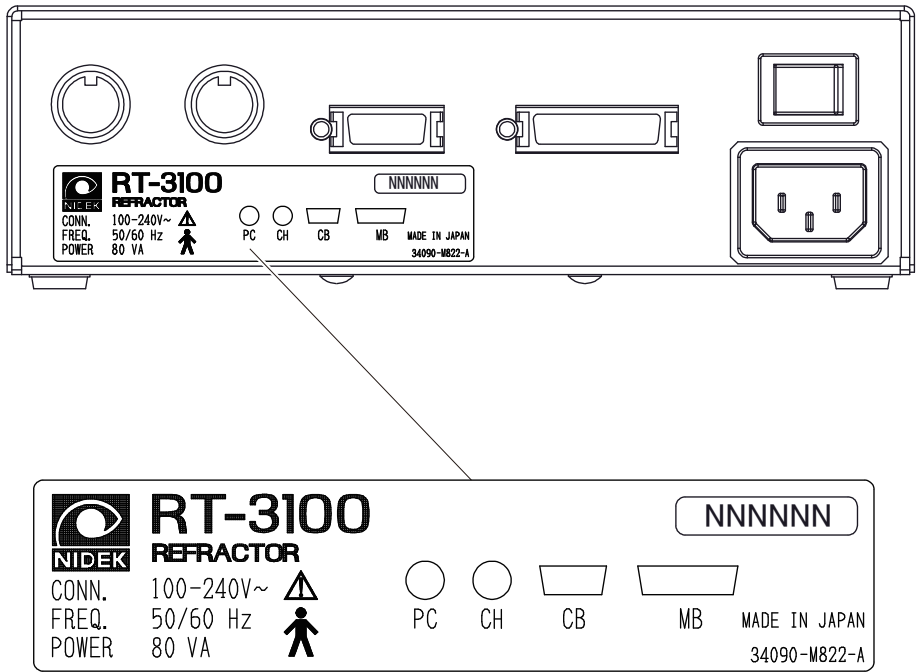


9.6 Labels

9.6.1 Control box



9.6.2 Relay box



9.7 DIP Switch Function Table

MB main board (34085-BA01)

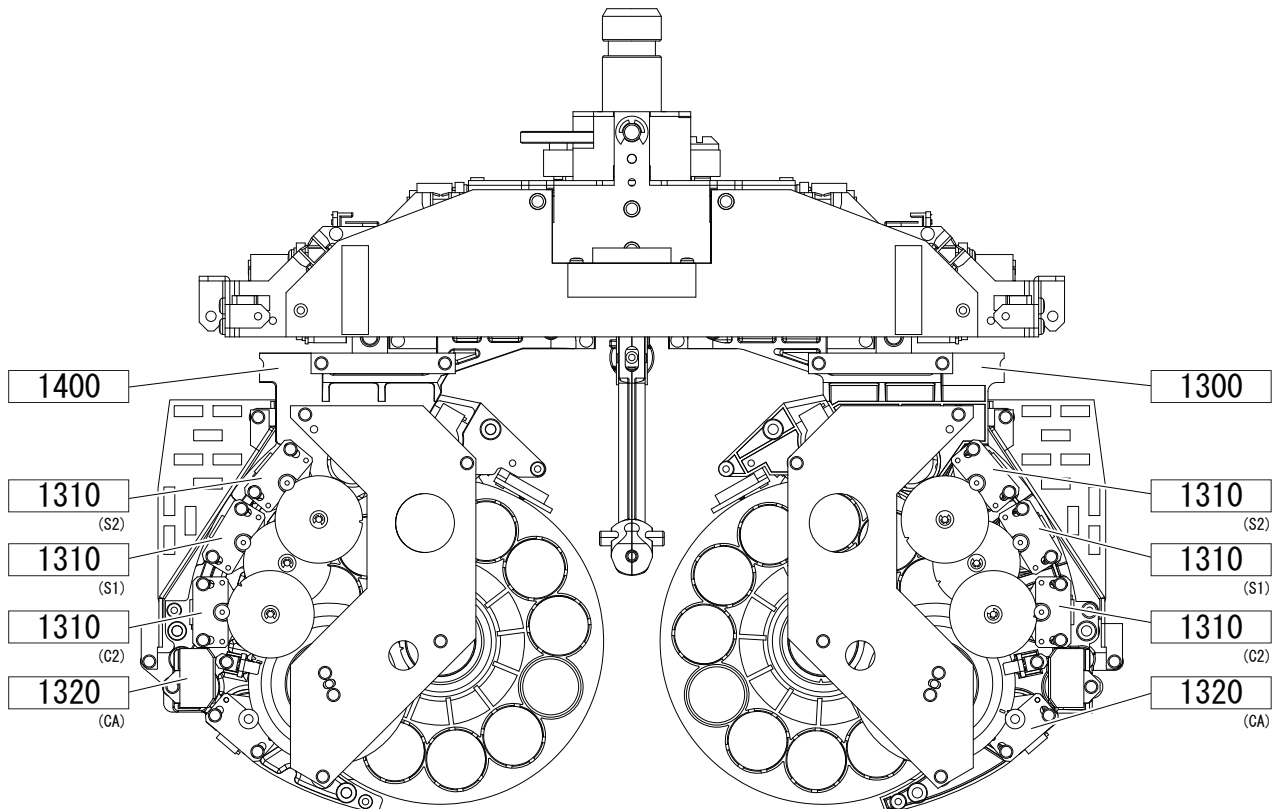
Switch No.	Functions	OFF	ON	Factory settings	Notes
1	Disk position adjustment mode (Input the "MB initial pulse")	No	Yes	OFF	Set all of switches 1, 2 and 3 for clearing position adjustment data to the ON position.
2	Lens cleaning mode	No	Yes	OFF	None for the PD and CONV
3	Gear adjustment mode	No	Yes	OFF	All motor torques are driven in 70% when and after initialization.
4	MAIN programming writing mode	No	Yes	OFF	Cancel all the motor initializing action when upgrading the MAIN program by single board.
5	Gear back rush correction amount of P1 and P2 on the left	Correction amount rather much	Correction amount rather less	Depending on the adjustment details	—
6	Gear back rush correction amount of P1 and P2 on the right	Correction amount rather much	Correction amount rather less	Depending on the adjustment details	—
7	No function	—	—	Always OFF	—
8	Low torque mode	No	Yes	OFF	The driving torque is set as 85% in gear adjustment mode.

CB main board (34090-BA11)

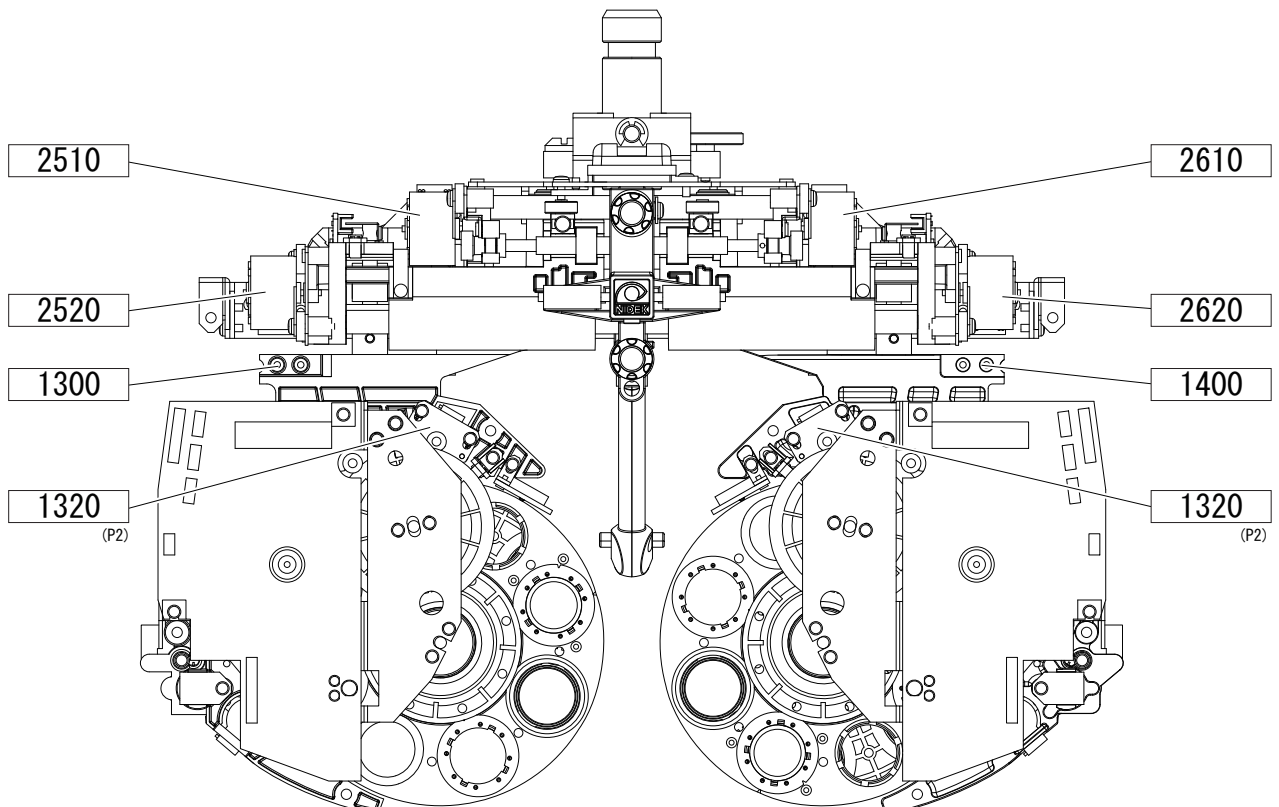
SW No.	Functions	OFF	ON
1	—	—	—
2	—	—	—
3	—	—	—
4	—	—	—
5	—	—	—
6	—	—	—
7	Already reserved	Always OFF	—
8	Single mode	No	Yes

9.8 Configuration of motors

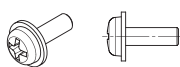
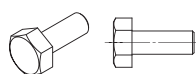
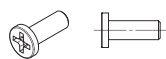
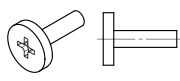
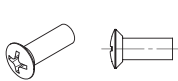
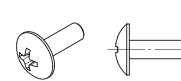
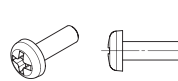
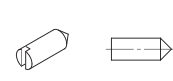
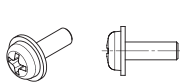
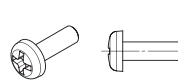
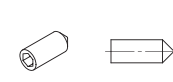
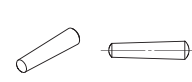
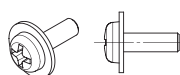
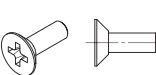
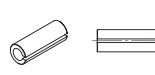
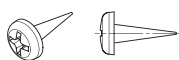
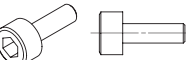
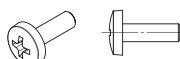
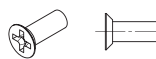
9.8.1 Patient's side



9.8.2 Operator's side



9.9 Screw List

N HEXAGON NUT-1**BS** SEMS FASTENER(with SW+PW)**HB** HEXAGON HEAD BOLT**SW** SPRING WASHER**3N** HEXAGON NUT-3**CK** MACHINE SCREW(Pan head)**HH** HEXAGON SOCKET SET SCREW**TB** MACHINE SCREW(Thin head)**3PW** WASHER-3**3CK** MACHINE SCREW(Pan head)**OC** MACHINE SCREW(Oval head)**TC** MACHINE SCREW(Truss head)**4W** WASHER(Special size)**CT** RETAINING RING-C TYPE**PC** MACHINE SCREW(Pan head)**TG** SLOTTED SET SCREW**5W** WASHER (Polyslider)**DS** SEMS FASTENER(with TW)**PT** TAPPING SCREW(Pan head)**TH** HEXAGON SOCKET SET SCREW**6W** WASHER (Nylon)**ET** RETAINING RING-E TYPE**PW** WASHER-1**TP** TAPER PIN**AS** SEMS FASTENER(with SW+3PW)**FC** FLAT HEAD SCREW**RP** SPRING PIN**TW** STAR WASHER**AT** TAPPING SCREW(Wood screw)**FG** SLOTTED SET SCREW(Flat point)**SB** HEXAGON SOCKET HEAD CAP SCREW**WW** WAVE WASHER**BC** MACHINE SCREW(Binding head)**FK** MACHINE SCREW(Flat head)**SP** STRAIGHT PIN